

A new species of genus *Polleniopsis* from India (Diptera: Calliphoridae) with a key to the Indian species

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Abstract

So far the genus, with the present description, includes 43 species from East Asia, Australia and Oceania. Three species were earlier known from India: *Polleniopsis annamensis* Kurahashi, 1972, *P. pilosa* Townsend, 1917 and *P. kashmirensis* Kurahashi and Okadome, 1976 (Bharti, 2015). The present species *Polleniopsis bomdilaensis* Bharti and Verves, sp. n. has been recorded from the state of Arunachal Pradesh, India. Original key to Indian species of genus *Polleniopsis* is also provided (after Bharti, 2015, with corrections).

Keywords: *Calliphoridae*, *Polleniopsis*, species composition, geographical distribution, habits, India, new species.

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Introduction

Genus *Polleniopsis* Townsend, 1917 belongs to *Onesia*-group of tribe Caliphorini from subfamily Calliphorinae (Kurahashi, 1972). 43 species of this genus are distributed in East Asia, Australia and Oceania (Bharti, 2015). Majority of the species prefer mountainous regions and have been collected up to an altitude of 4650m a. s. l. (*P. stenacra*). The adults of few species (*P. chosenensis*, *P. dandoensis*, *P. hokurikuensis*, *P. horii* and *P. mongolica*) have been reported to frequent flowers in mountains (Kurahashi, 1967; Kano *et al.*, 1968) with ecology of almost all the species unknown.

Materials and Methods

The fly was collected by an entomological net from an altitude of 2200m a.s.l. from North-east Himalaya. The material was examined under Nikon SMZ 1500 stereozoom microscope. Digital image was captured with the help of an MP evolution digital camera mounted on Nikon SMZ 1500 using Auto-Montage (Syncroscopy, Division of Synoptics, Ltd.) software. The images were processed and cleaned with Adobe Photoshop

CS5.

Results

Description of a new species

Polleniopsis bomdilaensis Bharti and Verves, sp. n. (Figures 1-3)

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Synonym: “*Polleniopsis undescribed species*”: Bharti, 2015: 65 (in key).

Head: Eyes bare, dichoptic, separated at vertex 0.32x, at level of antennal base 0.48x of head width. Frontal vitta parallel-sided, matt-black, with distinct grey-silver dusting around ocellar triangle, about 4x as wide as one of parafrontalia just in front of anterior ocellus. Parafrontalia broad at the level of antennal base, narrowed toward vertex, dark grey dusted, with numerous short, fine, black setae in anterior half and shining white spot lower of fore *pc ors*. A single regular row of *poc* present; *ori* 7; *ors* 2+1; all *oc* strong and long; *poc* weakly developed, hair-liked; *ovt* and *ivt*

well developed. Parafacialia at level of antennal base 0.28x of head length, black, with distinct silver pruinescence along facial ridge and genal groove, completely covered by numerous short, fine, black setulae. Face distinctly narrowed forwardly to vibrissal angles, black, grey-dusted, with well developed flat and broad facial carina. Facial ridge with numerous short black hairs in lower 2/5; vibrissae well developed. Genae 0.36x of head-height, black, silver-grey dusted, clothed with black hairs. Genal groove blackish brown, bare. Postgenae black, largely clothed with mid-long black hairs and longer yellow hairs on ventral position. Occiput black, covered with black hairs. Pedicel brownish, submetallic, its surface across pedicelar bristle black. First flagellomere matt black, about 2x as long as pedicel. Arista widened in basal 1/3, blackish brown basally to yellowish brown in apical part, long plumose. Palpi long and narrow, entirely blackish brown, almost not widened apically.

Thorax: Black, dark grey-dusted, covered with black hairs. Dorsum marked with three approximated narrow (median and a pair of submedian) and two lateral broad longitudinal black stripes on prescutum and scutum, each more distinctly visible when viewed from behind. Humeri, notopleura, sternopleura and scutellum concolorous with dorsum, more or less grey-dusted. Prosternum and propleura blackish hairy, the other pleura also with hairs. Supraspiracular convexity pubescent, pleurotergite with black hairs; postalar declivity with tuft of black hairs in the centre; both tympanic and para-squamal tufts consists of several black hairs; thoracic spiracles blackish. *acr* 0+2, one fore absent on the right side; *dc* 2+3; *ia* 0+1; *sa* 0+3; *pa* 2; *h* 2; *ph* 1 (inner only), *prs* 1, *npl* 2, *st (kepst)* 1 + 1; propleurals and prostigmatic bristles well-developed. Scutellum with strong pairs of *ap*, *subap*, *bas* and more short and fine *d*.

Wings: Membrane hyaline, slightly brownish tinged basally and along veins; veins fuscous brown; epaulet and basicosta black; subcostal sclerite fuscous brown, brownish pubescent. Node of veins R_1 and R_{2+3} with a few black setae above and below; section of R_{4+5} vein from bend to wing edge gently right curved inward and then running straight toward margin. Cell r_{4+5} open; upper calypter white, slightly grayish, with dark brown fringe, lower

one gray, with white fringe and several pale hairs on upper surface basally. Halteres brownish yellow.

Legs: Black. Mid tibia with 2 *ad*, 2 *pd*, 2 *p* and 1 strong and a single very long *av*; hind tibia with 3 *ad*, 1 *pd*, 1 *av* and 3 *pv*, (Anterior legs and left medial leg missing in holotype).

Abdomen: Ground colour metallic; dorsal surface clothed with black hairs. 1st+2nd and 3rd tergites dark blue, almost black, with purple reflections, silver-grey dusted in anterior parts, with several fine lateral adjacent marginals; 4th and 5th ones shining blue, slightly white dusted, with a trace of narrow black median stripe. 4th tergite with full row of erected marginal bristles; 5th tergite with numerous erect tiny discals and unclear marginals. All sternites black, grey-dusted, clothed with black bristly hairs.

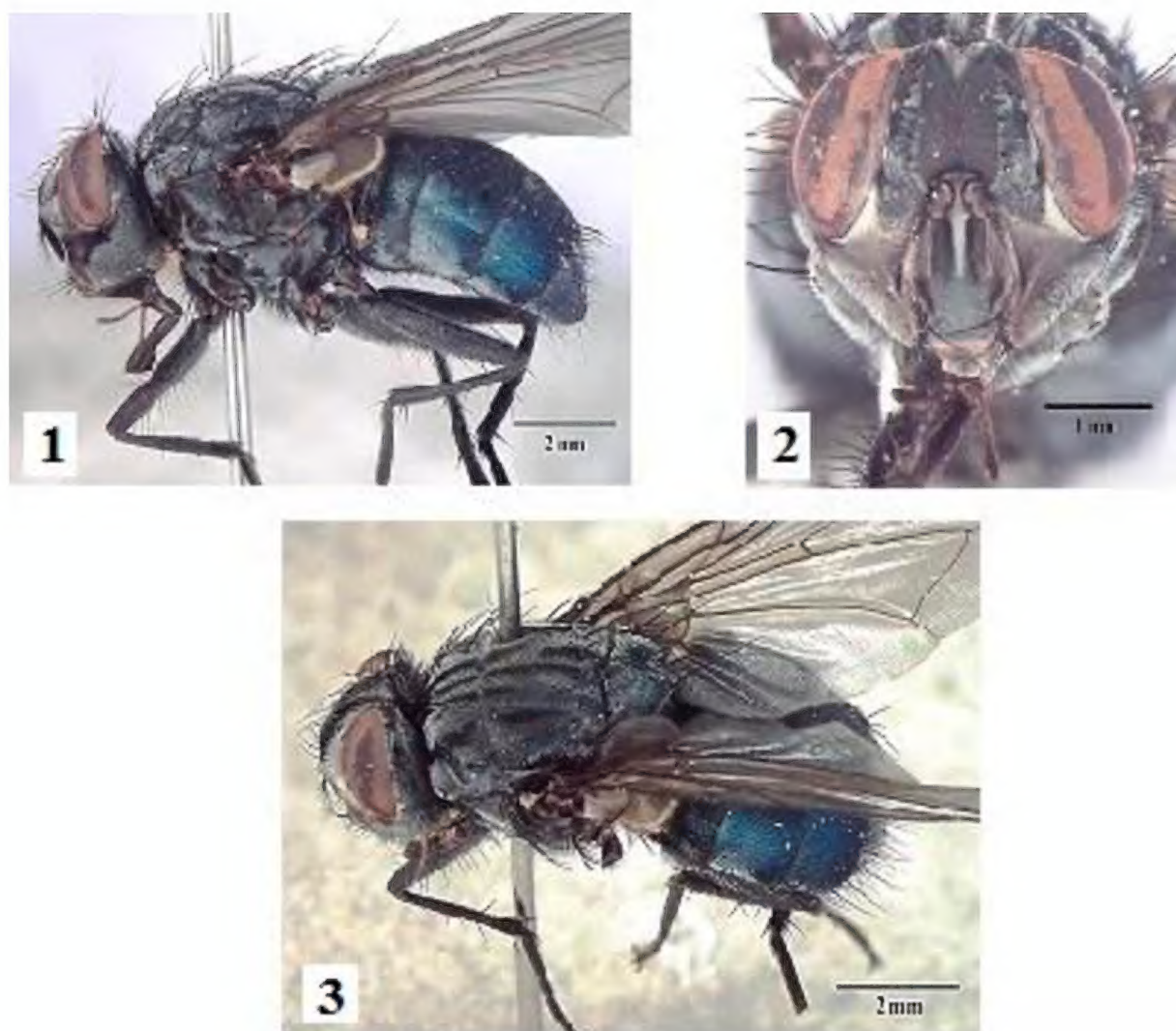
Measurement: Holotype (female): Body length: 9.8 mm.

Etymology: The specific name is given after the type locality, Bomdila (headquarters of West Kameng District in Arunachal Pradesh State, India).

Type material: Holotype (female). India, Arunachal Pradesh, Bomdila, 2200m a. s. l., 25.05.2014. Holotype in Department of Zoology and Environmental Sciences, Punjabi University, Patiala, Punjab, India.

Comparison: This species is related to *Polleniopsis kashmirensis* Kurahashi and Okadome, 1976 by metallic lustrous abdomen and black legs, but differs by blue colour of abdomen, black basicosta and presence of 2 pairs of postsutural *acr*.

Ecology: The West Kameng district is located in the western part of Arunachal Pradesh covering an area of 7422 km² and accounts for 8.86% of the total area of the state. The topography of the district is mostly mountainous. A greater part of it falls within the higher mountain zone, consisting of a mass of tangled peaks and valleys. The vegetation generally consists of temperate broad-leaved and conifer forests, scrubs and alpine meadows. The species *Polleniopsis bomdilaensis* was collected from the scrubs in secondary forest area.



Figures: 1-3. *Polleniopsis bomdilaensis*, ♀: 1, Body profile; 2, head frontal view; 3, Body dorso-lateral view.

Key to the species of *Polleniopsis* from India

1. Abdomen entirely dark grey to black, silver-gray dusted..... 2
- Abdomen metallic green or blue; legs entirely black 3
2. Scutellum blackish, covered with brownish grey dusting, femora and tibia light brown; basicosta orange; *acr* 0+1. 6-7 mm ***P. pilosa* Townsend**
India (Bihar, Meghalaya, West Bengal), Thailand (Chiang Mai, Kanchana Buri)
- Scutellum lead grey with grey dusting; legs fuscous to black, almost tibia and knees sometimes brownish; basicosta light brown; *acr* 0+2. 6-7 mm.....
..... ***P. annamensis* Kurahashi**
India (Karnataka), China (Hainan), Vietnam (Dalat).
3. Abdomen entirely metallic green; basicosta orange; *acr* 1+3. 6.5-7.5 mm
... ***P. kashmirensis* Kurahashi & Okadome**
India (Jammu and Kashmir)
- 1st+2nd and 3rd abdominal tergites dark blue, 4th and 5th ones light blue; basicosta black; *acr* 0+2 (figures 1-3). 10 mm
.... ***P. bomdilaensis* Bharti & Verves sp. n.**
India (Arunachal Pradesh)

Discussion

As stated earlier, the genus *Polleniopsis* Townsend, 1917 includes 43 species of which 15 [*P. annamensis* Kurahashi, 1972; *P. bomdilaensis* Bharti and Verves **sp. n.**; *P. choui* Fan and Chen, 1991; *P. dalatensis* Kurahashi, 1972; *P. degenensis* Chen and Fan, 1992; *P. elongata* Kurahashi, 1972; *P. gressitti* Kurahashi, 1972; *P. himalayana* Kurahashi, 1992; *P. kashmirensis* Kurahashi and Okadome, 1976; *P. nepalica* Kurahashi, 1992; *P. nigripalpis* Verves, 1991; *P. pilosa* Townsend, 1917; *P. pulchokii* Kurahashi, 1992; *P. xuei* Feng and Wei, 1998 and *P. zaitzevi* Verves, 1991] belong to the Oriental region, 19 [*P. allapsa* Villeneuve, 1942; *P. chosenensis* Fan, 1965; *P. cuonaensis* Chen and Fan, 1991; *P. dandoensis* Kurahashi, 1964; *P. discosternita* Feng and Ma, 1999; *P. fani* Feng and Ma, 1999; *P. hokurikuensis* Kurahashi, 1964; *P. horii* Kurahashi, 1964; *P. lata* Zhong, Wu and Fan, 1982; *P. latifacialis* Feng and Xue, 2000; *P. lushana* Feng and Ma, 1999; *P. micans* Villeneuve, 1942; *P. milina* Fan and Chen, 1987; *P. pseudophalla* Feng and Ma, 1999; *P. shanghaiensis* Fan and Chen, 1997; *P. stenacra* Chen and Fan, 1988; *P. varilata* Chen and Fan, 1992; *P. viridiventris*

Chen and Fan, 1988 and *P. zhaoi* Xue, 2005] to Eastern Palaearctic, four [*P. fulviventris* Kurahashi, 1972; *P. jamesi* Kurahashi, 1972; *P. patiens* (Walker, 1858) and *P. sarcophagoides* (Walker, 1861)] to Australian/Oceanian region, three species [*P. fukiensis* Kurahashi, 1972; *P. mongolica* Séguy, 1928 and *P. yunnanensis* Chen, Li and Zhang, 1988] are common for South-eastern part of Palaearctic and Oriental regions and two [*P. inconclusa* (Walker, 1861) and *P. toxopei* (Senior-White, 1926)] for Oriental and Australian/Oceanian regions (Fan *et al.*, 1992; Kurahashi, 1964, 1972, 1992; Kurahashi and Chowanadisai, 2001; Kurahashi and Magpayo, 2000; Kurahashi and Thapa, 1994; Xue and Chao, 1998; Verves, 2004, 2005; Yang *et al.*, 2014).

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On *Epuraea* Erichson of Assam, India (Coleoptera: Nitidulidae: Epuraeinae)

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Abstract

Four species of *Epuraea* Erichson [viz. *Epuraea* (*Haptoncurina*) *motschulskyi* (Reitter, 1873), *Epuraea* (*Haptoncus*) *luteola* Erichson, 1843, *Epuraea* (*Haptoncus*) *ocularis* Fairmaire, 1849 and *Epuraea* (*Micruria*) *viraktamathi* sp. n.] have been worked out of a collection from Assam, India. Of these, *Epuraea* (*Haptoncurina*) *motschulskyi* (Reitter, 1873) and *Epuraea* (*Haptoncus*) *luteola* Erichson, 1843 are first time recorded from this Indian state. These make the number of *Epuraea* species from Assam to 8. The genus *Epuraea* and the studied species are (re)described. A key to the subgenera and species of *Epuraea* from Assam is appended.

Keywords: *Coleoptera*, *Nitidulidae*, *Epuraea*, Assam, new species.

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Introduction

Assam with an area of 78,438 sq. km. (89° 42' E to 96° E and 24° 8' N to 28° 2' N) is located in biodiversity rich area of North-East India. The physiographic feature of the state is varied with about 15,68,760 hectares of the area under hilly topography, 2,35,798 hectares of land under forest cover while 3,98,860 hectares of land is under cultivation. Sharing international border with Bangladesh in the west, Bhutan in the north and national borders with Tripura to the south, Mizoram and Manipur to the south-east, Nagaland to the east, Arunachal Pradesh to the north, Meghalaya to the south-west and West Bengal to the west, Assam is divided into 23 districts with widespread tea plantation farms. The Brahmaputra valley in the north, the Barak valley in the south and the Karbi plateau and Cachar hills that borders the two regions constitutes the prime geographical characteristics of the state. The state has fertile alluvium soil fed with high precipitation and a network of water channels throughout the region. All these contributed to a rich vegetation and forest types of different kind. As a result, the quantitative and qualitative richness of beetles in this state is noteworthy. The sap beetle fauna

seemed to be considerably rich and it necessitated a field work for exploration of beetles from different habitats and their taxonomic analysis. About 34 species of *Epuraea* were recorded from India, 12 species from North-east India and 5 species from the state of Assam. The genus consists of 17 subgenera of which 5 subgenera [viz., *Epuraea* (*Haptoncurina*), *Epuraea* (*Haptoncus*), *Epuraea* (*Epuraea*), *Epuraea* (*Micruria*) and *Epuraea* (*Epuraeanella*)] are recorded from India and 4 subgenera [viz., *Epuraea* (*Haptoncus*), *Epuraea* (*Epuraea*), *Epuraea* (*Micruria*) and *Epuraea* (*Epuraeanella*)] are recorded from North-east India.

Several materials of *Epuraea* from the northeastern state of Assam formed the basis of this study. The *Epuraea* is a relatively large genus and hitherto recorded from few northeastern states of India with only 5 species recorded from Assam namely, *Epuraea* (*Haptoncus*) *fallax* (Grouvelle, 1897), *Epuraea* (*Haptoncus*) *ocularis* Fairmaire, 1849, *Epuraea* (*Micruria*) *convexa* Grouvelle, 1908, *Epuraea* (*Micruria*) *insolita* Grouvelle, 1908 and *Epuraea* (*Epuraeanella*) *fossicollis* Grouvelle, 1908.

Historical account

Kirejtshuk (1986) erected the tribe 'Epuraeini' with the type genus *Epuraea* Erichson, 1843 on the basis of structure of male genitalia, distally projected anal sclerite and less strongly excised hypopygidium in male. Kirejtshuk (1994) elevated Epuraeini to the subfamily level. Kirejtshuk (1998) while dealing with Epuraeinae of Indochina erected another tribe, 'Taenioncini' with the genera 'Taenioncus Kirejtshuk, 1984', 'Raspinotus Kirejtshuk, 1990', 'Taeniolinus Kirejtshuk, 1998' and 'Carpocryraea Kirejtshuk, 1998' under it. The tribe possesses the following combination of characters: elytra exposing 2-3 abdominal tergites; subparallel dorsal body, shape convex; sides of pronotum and elytra marginally explanate or entirely unexplanate and short and reduced pubescence. Kirejtshuk (*op. cit.*) included remaining four genera namely, 'Grouvellia Kirejtshuk, 1984', 'Epuraea Erichson, 1843', 'Propetes Reitter, 1875' and 'Tetrisus Murray, 1864' under the tribe 'Epuraeini'. Jelinek and Audisio (2007) in the Palaearctic Catalogue included six genera namely, 'Amystrops Grouvelle, 1906', 'Carpocryraea Kirejtshuk, 1998', 'Epuraea Erichson, 1843', 'Grouvellia Kirejtshuk, 1984', 'Tetrisus Murray, 1864' and 'Taeniolinus Kirejtshuk, 1998' under the subfamily Epuraeinae without considering any tribe under it.

Kirejtshuk (2008) continued to consider two tribes under Epuraeinae [Epuraeini and Taenioncini] and included fourteen genera under 'Epuraeini': 'Crepuraea Kirejtshuk, 1990', 'Epanuraea Scudder, 1892', 'Epuraea Erichson, 1843', 'Grouvellia Kirejtshuk, 1984', 'Mystronoma Kirejtshuk, 1990', 'Amedanyraea Kirejtshuk and Pakaluk, 1996', 'Amystrops Grouvelle, 1906', 'Parepuraea Jelinek, 1977', 'Ceratomeidia Kirejtshuk, 1990', 'Trimenus Murray, 1864', 'Ecnomaeus Erichson, 1843', 'Platychorina Grouvelle, 1905', 'Baloghmena Kirejtshuk, 1987' and 'Stauromenus Kirejtshuk and Kvamme, 2001'. He (*op. cit.*) included six genera under the tribe 'Taenioncini': 'Taenioncus Kirejtshuk, 1984', 'Raspinotus Kirejtshuk, 1990', 'Taeniolinus Kirejtshuk, 1998', 'Carpocryraea Kirejtshuk, 1998', 'Csiromenus Kirejtshuk and Kvamme, 2001 and

'Eutaenioncus Kirejtshuk and Kvamme, 2001'. Representatives of Epuraeinae are mycetophagous or anthophagous often associated with arboricolous fungi (Kirejtshuk, 1998).

Erichson (1843) erected the genus *Epuraea* and included thirty species under it with the type species *Nitidula decemguttata* Fabricius, 1792 [Deutschland, Preussen] non *Nitidula decemguttata* Olivier, 1790 (designation by Parsons, 1943: 185). The constitution and subgeneric divisions of *Epuraea* passed through several changes. Redtenbacher (1845, 1849, 1858 & 1874) characterized and keyed out *Epuraea* from other nitidulid genera. Erichson (1845) added several more species under it. Lacoirdaire (1854) and Jacquelin du Val (1858) redescribed the genus *Epuraea*. Thomson (1859) placed *Epuraea* under the 'Tribus Nitidulina'. Leconte (1861) placed *Epuraea* under Tribe 'Nitidulini'. Thomson (1862) keyed out few species of *Epuraea* from Scandinavia. Reitter (1872) added few species under the genus *Epuraea*. Reitter (1873) dealt with both European and Non-European species of *Epuraea*, described and synonymized several species of *Epuraea*. Reitter (1875a) re-characterized the genus *Epuraea*. Horn (1879) divided *Epuraea* into three species groups on the basis of distance between hind coxae, and the shape of middle and hind tibiae. Broun (1880) described a species of *Epuraea* from New Zealand. Reitter (1884) dealt with the species of *Epuraea* from Japan. Fowler (1884) and Reitter (1894) re-characterized few species of *Epuraea*. Fowler (1889) keyed out and re-described several species of *Epuraea* from the British Islands. Sharp (1890) while dealing with the fauna of Central America, described a few more species under *Epuraea*. Everts (1898) placed *Epuraea* under subfamily 'Nitidulinae' and tribe 'Nitidulini', and provided a key to the species of *Epuraea* of Netherlands and adjacent areas. Ganglbauer (1899) divided *Epuraea* into four subgenera namely, 'Micrurula Reitter', 'Omosiphora Reitter', 'Dadopora C.G. Thomson' and 'Epuraea s. str.'. Grouvelle (1908) divided *Epuraea* into two subgenera namely, 'Epuraea s. str.' and 'Micrurula Reitter, 1884'. Blatchley (1910) divided the *Epuraea* into two species groups A and B based on the

shape of male tibiae. Reitter (1911) while dividing the *Epuraea* into subgenera followed the classification of Ganglbauer (1899). Grouvelle (1913a) in the Coleopt. Cat. included four subgenera of *Epuraea* namely, '*Epuraea* s. str.', '*Dadopora* C.G. Thomson, 1859', '*Epuraeanella* Crotch, 1874' and '*Micrurula* Reitter, 1884'. Reitter (1919) divided the *Epuraea* into three subgenera namely, '*Epuraenella* Crotch', '*Epuraea* s. str.' and '*Micruria* Reitter'. Sjöberg (1939) described several species of *Epuraea* from Palaearctic region and provided a key to the species of *Epuraea*. Parsons (1943) while dealing with the Nearctic Nitidulidae provided a key to the species of *Epuraea* of Nearctic Region. Apparently, he (*op. cit.*) recognized characters of the subgenera '*Dadopora* Thomson, 1859', '*Epuraeanella* Crotch, 1874' and '*Micrurula* Reitter, 1884' in his generic description but he didn't divide *Epuraea* into different subgenera and dealt the nearctic species in no nominate subgenera under *Epuraea*. Hansen (1950) divided *Epuraea* into eight groups and keyed out 35 species under the genus. Böving and Rozen (1962) dealt with the mature larvae of *Epuraea*. Jelínek (1977) while dealing with *Epuraea* of Africa, re-described the genus and added few species under it. Jelínek (1978) while dealing with Nitidulidae of Bhutan described seven species under *Epuraea*. Pototzkaya (1978) and Hayashi (1978) characterized the larvae of few *Epuraea* species. Kirejtshuk and Pakaluk (1996) erected the subgenus '*Horniraea*' and '*Amedanyraea*' under *Epuraea* and recognized six other subgenera namely, '*Haptoncus* Murray, 1864', '*Haptoncurina* Jelínek, 1977', '*Marinexa* Kirejtshuk, 1989', '*Epuraea* s. str.', '*Epuraeanella* Crotch, 1874' and '*Orthopeplus* Horn, 1879' under the genus *Epuraea*. Kirejtshuk (1998) divided the genus into seven subgenera from Indo-Malayan region namely, '*Ceroncura* Kirejtshuk, 1994', '*Epuraea* Erichson, 1843', '*Epuraeanella* Crotch, 1874', '*Ommoraea* Kirejtshuk, 1998', '*Haptoncurina* Jelínek, 1977', '*Haptoncus* Murray, 1864' and '*Micruria* Reitter, 1874'. Kirejtshuk (2005) while dealing with the nitidulid fauna of Taiwan, described two species under *Epuraea*. Kurochkin and Kirejtshuk (2006) dealt with the synonymy, variability and bionomy of two

species of *Epuraea* and considered them conspecific. Jelínek and Audisio (2007) in Palaearctic Catalogue included seven subgenera under *Epuraea* namely, '*Aphenolia* Reitter, 1884', '*Epuraea* Erichson, 1843', '*Epuraeanella* Crotch, 1874', '*Haptoncurina* Jelínek, 1977', '*Haptoncus* Murray, 1864', '*Micruria* Reitter, 1874' and '*Polinexa* Kirejtshuk, 1989'. Kirejtshuk (2008) included 17 subgenera under *Epuraea* namely, '*Epuraea* Erichson, 1843', '*Ceroncura* Kirejtshuk, 1994', '*Dadopora* Thomson, 1859', '*Strophoraea* Kirejtshuk and Kvamme, 2001', '*Epuraeanella* Crotch, 1874', '*Ommoraea* Kirejtshuk, 1998', '*Micruria* Reitter, 1874', '*Aphenolia* Reitter, 1884', '*Africaraea* Kirejtshuk, 1989', '*Apria* Grouvelle, 1919', '*Haptoncus* Murray, 1864', '*Haptoncurina* Jelínek, 1977', '*Blackburnaea* Kirejtshuk and Kvamme, 2001', '*Marinexa* Kirejtshuk, 1989', '*Polinexa* Kirejtshuk, 1989', '*Horniraea* Kirejtshuk and Pakaluk, 1996' and '*Orthopeplus* Horn, 1879'. Avgin *et al.* (2012) described a species of *Epuraea* from Turkey. Hisamatsu and Kirejtshuk (2013) added a new species of *Epuraea* from the Palaearctic region.

Material and Methods

The present work is based mainly on the collection of the authors (JD in 2014) and some specimens by the courtesy of Dr. C.A. Viraktamath. A field trip was conducted in Assam from 22.02.2014 to 05.03.2014 and sap beetles were collected from different habitats. Some specimens (by unknown collector) were obtained for study. Specimens were collected from flowers and rotten fruits/vegetables with a soft brush and preserved in 70% alcohol. The specimens were mounted on rectangular hard paper board and pinned with proper locality and habitat data. For detailed morphological study, slides were prepared of the dissected parts. Mounted dry specimen of *Epuraea* (*Haptoncurina*) *motschulskyi* (Reitter, 1873) was relaxed first by putting in water for about an hour. The relaxed specimen was placed on glass slide with a drop of water and the hind wings and elytra were dissected out under a dissecting microscope. The wingless body was then placed in 10% KOH solution, after minor incision between pro- and mesothorax and metathorax and abdomen, for about 24 hours. The specimen

was then washed in distilled water and mild acetic acid solution for 10 minutes respectively. The washed specimen was passed on to absolute alcohol through 30%, 50%, 70%, 90% grades of alcohol for 10 minutes in each grade. The detached elytra and wings were similarly dehydrated as above. All the parts were kept in absolute alcohol for about 10-15 minutes for complete dehydration and then transferred to clove oil. The body parts of the specimen were then placed on a clear glass slide with a drop of clove oil and finally dissected under a WILD M5A stereoscopic binocular microscope. The dissected parts were mounted in Canada balsam by cover slips. For studying male genitalia of the other specimens, their abdomens were separated from the body. The wet/water soaked abdomens were placed in 10% KOH solution for about 24 hours and then passed on to clove oil in above manner. Each of the male genitalia was dissected out with two fine dissecting needles under the stereomicroscope and placed in a drop of Canada balsam on a piece of cover glass. The cover glass was glued on a piece of ivory paper and pinned with the respective specimen with required data for types and other specimens. External features and other structures were studied using Leica ® M205A stereoscopic microscope with magnification 7.81× to 160.1× and images were recorded, when necessary. Illustrations were made with the aid of Camera lucida; detailed features of various body parts were sketched by using the digitized images, and examination under an OLYMPUS compound microscope.

Results

Altogether 4 species are recognized under three subgenera [*Epuraea* (*Micruria*), *Epuraea* (*Haptoncus*), and *Epuraea* (*Haptoncurina*)]. These species [viz. *Epuraea* (*Haptoncurina*) *motschulskyi* (Reitter, 1873), *Epuraea* (*Haptoncus*) *luteola* Erichson, 1843, *Epuraea* (*Haptoncus*) *ocularis* Fairmaire, 1849 and *Epuraea* (*Micruria*) *viraktamathi* sp. n.] and supra-specific taxa are characterized of which one, i.e., *Epuraea* (*Micruria*) *viraktamathi* sp. n. is new to science and two species, viz., *Epuraea* (*Haptoncurina*) *motschulskyi* (Reitter, 1873) and *Epuraea* (*Haptoncus*) *luteola* Erichson,

1843 are newly recorded from the state of Assam. These are not re-described for want of material in hand, but are included in the key to the species from Assam state. The material of the present study has been found from different habitats like flowers, decaying fruits and vegetables.

Systematic Account

Family NITIDULIDAE Latreille, 1802

Subfamily EPURAEINAE Kirejtshuk, 1986

Tribe EPURAEINI Kirejtshuk, 1986

Genus *Epuraea* Erichson, 1843

Epuraea Erichson, 1843: 267. Type species: *Nitidula decemguttata* Fabricius, 1792, nec. *Nitidula decemguttata* Olivier, 1790 (designation by Parsons, 1943: 185); Sturm, 1844: 44; Erichson, 1845: 139, 140; Redtenbacher, 1845: 74; Redtenbacher, 1849: 20, 163; Redtenbacher, 1858: LXXIX, 325; Lacordaire, 1854: 301, 302; Jacquelin du Val, 1858: 141, 158; Thomson, 1859: 68; Leconte, 1861: 83; Thomson, 1862: 168; Thomson, 1867: 378; Seidlitz, 1872: 31; Reitter, 1872: 1–36; Reitter, 1873: 10, 17; Redtenbacher, 1874: LXXXVI, 357; Reitter, 1875a: 5; Reitter, 1875b: 57, 63; Horn, 1879: 287, 288; Broun, 1880: 168; Everts, 1881: 12, 19; LeConte and Horn, 1883: 150; Fowler, 1884: 92; Reitter, 1884: 259, 260; Marseul, 1885: 20, 46; Seidlitz, 1888a: 92, 210; Seidlitz, 1888b: 225; Fowler, 1889: 225; Sharp, 1890: 306; Everts, 1898: 469, 474; Ganglebauer, 1899: 464, 470; Lameere, 1900: 345, 346; Grouvelle, 1908: 340, 346; Blatchley, 1910: 636; Reitter, 1911: 26, 29; Grouvelle, 1913: 107; Reitter, 1919: 60; Sjöberg, 1939: 108; Parsons, 1943: 185; Méquignon, 1954: 30; Hansen, 1950: 50; Böving and Rozen, 1962: 292 (larvae); Spornraft, 1967: 51; Jelínek, 1977: 350; Jelínek, 1978: 179–199; Pototzkaya, 1978: 570 (larvae); Hayashi, 1978: 12–15, 33–34 (larvae); Audisio, 1980: 126; Kirejtshuk, 1989: 64–77; Kirejtshuk, 1992: 120; Audisio, 1993: 280; Kirejtshuk and Pakaluk, 1996: 139; Kirejtshuk, 1998: 57–59; Jelínek and Audisio, 2007: 459–465; Kirejtshuk, 2008: 109.

Description

General appearance (Pl. I. Fig.1–7; Pl. II. Fig. 8–15): Broadly elongate, moderately convex dorsally and sub-depressed ventrally, moderately shiny, punctate-pubescent, color testaceous to black, antenna with loosely arranged three-segmented club [except *Epuraea (Ceroncura)* with eight-segmented antennal club], pronotal and elytral sides usually bordered and feebly explanate; at least one abdominal segment exposed, shape of mid-tibiae and length of fore-tarsi bear characters of sexual dimorphism.

Head (Pl. II. Fig. 1) transverse, markedly narrower than prothorax, mandibles partly exposed, no fronto-clypeal suture; eyes moderately large and somewhat projecting, finely faceted, tempora variable, ranging from short platform-like to extending beyond outer edge of eyes; distinct neck constriction. Tentorium with two long tentorial arms and a transverse corporotentorium in posterior third. Antenna slightly longer than head; antennal insertions partially hidden under projections of frons, scape broadly elongate, antennomere 2 broader than antennomere 3; antennomeres 4 to 8 subequal, about as broad as long or slightly elongate; club 3-segmented, moderately broad. Ventrally antennal grooves narrow and converge posteriorly. Mandible (Pl. II. Fig. 8.) about as broad as long, with a large bifid apical tooth on inner margin, tip of mandibles often pointed, mola well-developed, no distinct mandibular cavity. Maxilla (Pl. II Fig. 9) devoid of galea; lacinia broadly elongate, apex rounded, apex and inner margin densely hairy; palpi with palpomere 1 short, palpomeres 2 and 3 subequal and elongate; palpomere 4 (apical segment) longer than preceding segment and fusiform, sparsely setose. Labium (Pl. II. Fig. 10) with mentum distinctly transverse and deeply emarginate anteriorly; ligula about as broad as long, palpi with palpomere 1 short, palpomere 2 longer and transverse, palpomere 3 longest, fusiform. Labrum (Pl. II. Fig.11) transverse, apically bilobed.

Prothorax (Pl. I Fig. 2) transverse, about as broad as elytra; apical margin emarginate; anterior and posterior angles devoid of any spine; side margins often bordered, smooth and arcuate; pronotal disc feebly convex; prosternal process rather narrow between coxae, broader

and bulbous towards apex; front coxae internally contiguous; coxal cavities distinctly transverse, externally and internally closed, trochantins exposed; notosternal sutures divergent anteriorly and extending to border of foramen.

Meso-metathorax (Pl. I. Fig. 3): Mesoventral process narrower than prosternal process but mesocoxae slightly more widely separated than front coxae, coxal cavities open outwardly, mesoventral fitting between mesocoxae almost in a straight line. Metaventrite about as broad as long, dicrimen extending to about three-fourths of length of metaventrite from base, hind coxae more widely separated than mesocoxae (external separation); mesocoxae not bordered by coxal lines. Metendosternite (Pl. II Fig. 12) well-developed, with a broad basal stalk bifurcated into two lateral arms, anterior tendons moderately widely separated.

Elytra and Wings: Elytra (Pl. I. Fig. 4) short, truncate apically, punctation indistinct, small and not in linear rows; pubescence short; epipleura moderately developed and not extending up to apex; tergite 5 fully and 4 partially exposed. Wing (Pl. I. Fig. 6) simple and venation reduced, with moderately long radial vein, cubitus vein branched, two anal veins; without subcubital fleck or radial cell.

Legs (Pl. I. Fig. 7) moderately long and broad, trochanters short and simple, femora swollen towards middle; tibiae slightly broadened at apex with distinct apical spurs; tarsal formula 5-5-5 in both sexes, tarsomeres 1 to 3 lobed and dilated apically, tarsomere 4 shortest, tarsomeres 1 to 3 ventrally more setose, claws simple.

Abdomen (Pl. I. Fig. 5) about as long as broad or slightly longer, with distinct pygidium, intercoxal process of first ventrite moderately broad and its apical margin slightly angulate; ventrites 2–4 short and subequal, ventrite 5 longer than other ventrites. An additional anal sclerite (tergite VIII) present in males at the end of 5th ventrite.

Genitalia: Aedeagus (Pl. II. Fig. 13, 14) with membranous median lobe considerably variable in shape, ranging from elongate to spindle-shaped, sometimes bent near base, sides arcuate or straight; a single median strut running along ventral face; tegmen forming semicircular envelop, the cap-piece formed of two elongated lateral lobes (parameres) with a deep median

excision and turned down along lateral edges, basal corners meeting together on the ventral side of median lobe. Spiculum gastrale and anal sclerite (as in Pl. VI. Fig. 42). Ovipositor (Pl. II. Fig. 15) with well-developed paraprocts, valvifers, coxites and slender styli attached preapically to the coxites.

Sexual Dimorphism: 8th tergite in male transformed into anal sclerite. Structure of leg, especially the shape of tibiae and tarsi often bears characters of sexual dimorphism.

Habitat: Most species feed usually on decaying plant tissues, fruits and vegetables, fungi, fermenting sap and pollen in flower.

Distribution: The representatives of this subfamily are primarily distributed in the Eastern Hemisphere with major diversity in Palaearctic and Indo-Malayan regions (Kirejtshuk, 1998) and very few representatives from South America.

Note: The characteristic feature of *Epuraea* shows its resemblances with *Carpophilus* Stephens of Carpophilinae. Or otherwise these subfamilies Carpophilinae and Epuraeinae are close lineages.

KEY TO THE SUBGENERA AND SPECIES OF EPURAEA ERICHSON OF ASSAM

1. Eyes composed of rather large facets with diameter about as large as thickness of tarsomere 5 at base; male anal sclerite strongly convex dorsally.....2
- Eyes composed of moderately small facets with diameter much less than thickness of tarsomere 5 at base; male anal sclerite never strongly convex dorsally.....5
2. Head with large eyes and temples not extending behind them; body, slender and less oval. Body color yellow testaceous, facies elongate; male genitalia with elongate tubular median lobe with subparallel sides and a single median strut; tegmen with paired parameres forming a tubular shape, with a horn-like tegminal strut from basal extremity of each paramere.....*Epuraea*

(*Haptoncurina*) *motschulskyi* (Reitter, 1873)

- Head with smaller eyes and temples more or less wedged in their back side, not infrequently extended beyond outer edge of eyes; body usually more robust and conspicuously oval.....*Epuraea* (*Haptoncus*) Murray, 1864.....3
- 3. Body uniformly colored.....4
- Body testaceous with distinct dark spots on elytra and sometimes on pronotum. Male hind tibiae devoid of distinct curvature and dilation in the middle; male genitalia bearing elongate pear-shaped median lobe with arcuate sides, a single median strut; tegmen with paired broadly elongate parameres with broader basal half, apices bent and converge like closing ends of a gripping clip, with two horn-like tegminal struts from extremities of anterior margin of the ventral face of each paramere; lateral lobes in lateral view considerably bent, narrowed towards apices behind basal third, apices bluntly acute, studded with moderately long setae on inner borders of apical third.....*Epuraea* (*Haptoncus*) *ocularis* Fairmaire, 1849
- 4. Anterior margin of pronotum shallowly emarginate; temples never extended beyond outer edge of eyes; male hind tibiae without any distinct curvature; male genitalia with somewhat elongate tubular median lobe with subparallel sides, tegmen with paired cylindrical parameres.....*Epuraea* (*Haptoncus*) *fallax* (Grouvelle, 1897)
- Anterior margin of pronotum with trapezium-like emargination; temples often extended beyond outer edge of eyes; male hind tibiae distinctly curved and somewhat dilated in middle; male genitalia with elongate triangular-shaped median lobe broader at base and narrower towards apex, with a median longitudinal furrow extending from base to apex and a single median strut; tegmen with paired parameres forming a C-shaped cup, tegminal struts not distinct.....*Epuraea* (*Haptoncus*) *luteola* Erichson, 1843
- 5. Tarsal claws with a more or less raised tooth at base; dorsum largely dull and rather conspicuously microreticulated (except for

- consobrina*-group with comparatively weak tooth and specific type of secondary sexual dimorphism in structure of legs); ventral side of epicranium devoid of deep and sharply outlined antennal grooves and postocular fossae of simple configuration; hind coxae not widely separated from each other.....*Epuraea* (*Micruria*) **Reitter, 1875**.....6
- Tarsal claws simple or slightly bulging at base; dorsum often shiny and variable in sculpture; ventral side of epicranium with very deep and sharply outlined antennal grooves, strongly approaching towards each other, with postocular fossae of complex configuration (Pl. VII. Fig. 53); hind coxae widely separated. Pronotum with distinctly rounded sides, narrower to both apex and base; elytral sides with arcuate and moderately explanate, apices transversely truncate.....*Epuraea* (*Epuraeanella*) **fossicollis Grouvelle, 1908**
 - 6. Pronotum with convex or straight basal margin and posterior corners more or less rounded or subrectangular, never projecting posteriorly. Tarsal claws long with a strong and sharp tooth at base; male genitalia with tegmen elongate-oval shaped tapering towards apex, median lobe parallel-sided and gradually converging near apex*Epuraea* (*Micruria*) **insolita Grouvelle, 1908**
 - Pronotum with bisinuate basal margin and its posterior corners projecting posteriorly.....7
 - 7. Elytra more than twice as long as pronotum; tarsal claws with weak tooth at base. Fore tibiae with one or two weak subapical teeth.....*Epuraea* (*Micruria*) **convexa Grouvelle, 1908**
 - Elytra about twice as long as pronotum; tarsal claws with strong tooth at base (Pl. VII. Fig. 51). Body oval, convex, chestnut brown in colour; mid-tibiae in males show distinct curvature on the interior sides (see Pl. VII. Fig. 50); elongate pear-shaped median lobe of male genitalia with arcuate sides and a single median strut that bifurcates at apex; tegmen with paired C-shaped parameres having broader basal half and a horn-shaped structure directed anterad, apices bent and converge with a single long preapical setae (see Pl. VI. Fig. 37-39).....*Epuraea* (*Micruria*) **viraktamathi sp. n.**
- 1. *Epuraea* (*Haptoncurina*) *motschulskyi* (Reitter, 1873)**
- Epuraea angustula* Motschulsky, 1863: 439.
Epuraea opaca Motschulsky, 1863: 440
Epuraea motschulskii Reitter, 1873: 29; Sjöberg, 1939: 109.
Haptoncus insularis Grouvelle, 1906a: 319; Grouvelle, 1913: 96; Gillogly, 1962: 175.
Haptoncus motschulskyi: Grouvelle, 1908:344; Grouvelle, 1913: 97; Grouvelle, 1914: 41; Gillogly, 1982: 288.
Epuraea weisei Grouvelle, 1909: 132.
Haptoncus dispersus: Gillogly, 1969: 248.
Haptoncurina motschulskyi: Jelinek, 1977: 381; Hisamatsu, 1985: 180.
Haptoncurina motschulskyi: Audisio, 1982: 107.
Epuraea motschulskyi: Jelinek, 1978: 172.
Haptoncus rhombotelus Gillogly, 1982: 286.
Epuraea (*Haptoncurina*) *motschulskyi*: Kirejtshuk, 1987: 65; Kirejtshuk, 1992: 121; Jelinek, 1992: 411; Kirejtshuk and Pakaluk, 1996: 339.
Epuraea (*Haptoncurina*) *motschulskyii*: Kirejtshuk, 1996: 24.
- Facies*** (Pl. III. Fig. 16,17) broadly elongate, subdepressed, moderately shiny, color testaceous-yellow, finely punctate dorsum; cuticle with sparse, thin, moderately long, golden, decumbent pubescence.
Head transverse, about 1.3x as broad as long, frons feebly depressed; punctures on vertex minute, round and shallow; eyes large and moderately projected, outer margin rounded, coarsely faceted, about 0.5x as long as head, temple short and slightly extended beneath the eye; punctation on frons round, indistinct, separated by about 1–2 diameters of punctures; pubescence on frons moderately long, thick, decumbent, directed inward. Antenna about 1.2x as long as head; antennal club about 1.5x as long as broad, club segments somewhat loosely attached, about 0.3x as long as antenna.
Prothorax transverse (1.0: 1.7), somewhat quadrate, anterior margin slightly emarginate; sides uniformly arcuate, posterior margin bisinuate and broadly round medially, anterior and posterior angles obtusely rounded.

Pronotum slightly convex, surface distinctly punctate, punctures round, rather sparse, separated on top of pronotal disc by 1–2 diameters, pubescence on disc moderately long, decumbent, uniformly arranged.

Scutellum transverse, about 1.6x as broad as long, triangular and pointed apically, with blackish border; punctures smaller than those on pronotum, separated by about 0.75–1 diameter, pubescence short and fine.

Elytra about 1.1x as long as broad, anterior margin closely fit with posterior margin of prothorax, humeral angles obtuse, sides subparallel, borders slightly explanate, apices separately rounded; punctures slightly coarser than those on pronotum, sparsely arranged, separated by 1–2 diameters; pubescence moderately dense and long, decumbent, posteriorly directed. Exposed tergites of abdomen about 1.2x as broad as long, abdomen in male bear additional sclerite which is both dorsally and ventrally visible, punctures small, round, separated by about 2–3 diameters; pubescence rather short, uniformly arranged, closely appressed to the surface of the abdomen, posteriorly directed.

Legs moderately long and slender.

Ventral side uniformly testaceous-yellow; gular region of head with posteriorly converging antennal grooves. Prosternal projection narrow between the procoxae with a depressed, broad, bulbous apex; mesoventrite transverse, darker than the rest of the ventrites, glabrous; metaventrite punctate-pubescent.

Aedeagus (Pl. II. Fig. 13, 14; Pl. III. Fig. 18, 19): Elongate tubular median lobe with subparallel sides and a single median strut; tegmen with paired parameres forming a tubular shape, with a horn-like tegminal strut from basal extremity of each paramere.

Measurements (in mm.): Total length 2.24–2.30, width of head across eyes 0.37–0.38, length of antenna 0.46–0.47, length and width of prothorax 0.46–0.48 and 0.79–0.85, length and width of elytra together 1.03–1.08 and 0.88–0.91.

Material examined: 6 exs., 4♂, 2♀, INDIA: Assam, Cachar Distt., Bhagabazar [25.566855° N, 91.892372° E], 27.ii.2014, J. Dasgupta, ex.

Bottlegourd flower (*Lagenaria siceraria* (Molina) Standl.); 10 exs., 4♂, 6♀, Assam, Dibrugarh, Marwari patty, Hanuman Temple [27.48479° N, 94.90192° E], 22.ii.2014, J. Dasgupta, ex. Kalmi flower (*Ipomoea* sp.).

Distribution: INDIA: Assam (New Record), Uttar Pradesh, West Bengal (Darjeeling), Uttarakhand (Kumaon); NEPAL; BHUTAN; THAILAND; VIETNAM; SRI LANKA; CHINA; MALAYSIA; PHILIPPINES; INDONESIA; PAPUA NEW GUINEA; AFGHANISTAN; TAIWAN; KOREA; JAPAN; AUSTRALIA; MICRONESIA; CAROLINE ISLANDS; MADAGASCAR; SEYCHELLES; SOUTH AFRICA; ANGOLA; NAMIBIA; ZAMBIA; SENEGAL; GAMBIA; MALI; GUINEA; SIERRA LEONE; LIBERIA; TOGO; NIGERIA; GABON; CAMEROON; ZAIRE; SUDAN; ETHIOPIA; KENYA; UGANDA; RWANDA; BURUNDI; TANZANIA.

2. *Epuraea (Haptoncus) luteola* Erichson, 1843

Epuraea luteola Erichson, 1843: 272; Chevrolat, 1863: 602; Reitter, 1873: 29; Horn, 1879: 301; Olliff, 1885:70; Audisio, 1993: 316.

Nitidula intendens Walker, 1858: 206; Olliff, 1885: 70.

Nitidula submaculata Walker, 1859: 52, Olliff, 1885:70.

Haptoncus pubescens Murray, 1864: 403; Olliff, 1885:70; Grouvelle, 1913:97; Kirejtshuk, 1992: 122.

Haptoncus testaceus Murray, 1864: 403; Grouvelle, 1913: 98; Kirejtshuk, 1992: 122.

Epuraea vulpecula Redtenbacher, 1867: 34; Reitter, 1873: 29.

Haptoncus pauperculus Reitter, 1873: 179; Grouvelle, 1913: 97.

Epuraea texana Crotch, 1874: 76; Horn, 1879: 334; Parsons, 1943: 184.

Haptoncus texanus Grouvelle, 1913: 97.

Haptoncura luteola: Reitter, 1875: 62.

Haptoncus subquadratus: Fauvel, 1903: 301; Grouvelle, 1906b: 75; Grouvelle, 1913: 97.

Haptoncus vulpecula: Grouvelle, 1913: 98

Haptoncura subquadrata Reitter, 1877: 22; Blackburn, 1891: 105.

Haptoncura albertisi Reitter, 1880a: 455; Kirejtshuk, 1992: 122.

Epuraea intendens: Olliff, 1885: 70.

Epuraea submaculata: Olliff, 1885: 70;
Grouvelle, 1908: 352; Grouvelle, 1913: 124.

Haptoncus luteolus: Sharp, 1890: 305;
Grouvelle, 1905: 242; Grouvelle, 1906c: 75;
Grouvelle, 1908: 346; Grouvelle, 1913: 96;
Grouvelle, 1914: 38; Parsons, 1943: 176;
Nakane, 1959: 56; Gillogly, 1962: 176;
Gillogly, 1969: 248; Kehat *et al.*, 1976: 93;
Hayashi, 1978: 15, 33; Gillogly, 1982: 287;
Endrödy-Younga, 1982: 268; Audisio, 1982:
107; Hisamatsu, 1985: 180.

Haptoncus floreolus Sharp, 1890: 305;
Grouvelle, 1913: 96.

Haptoncus ochraceus: Grouvelle, 1912: 388;
Grouvelle, 1913: 97.

Haptoncus albertisi: Grouvelle, 1913: 96.

Haptoncus intendens: Grouvelle, 1913: 96.

Epuraea (Haptoncus) luteola: Kirejtshuk, 1992:
122; Kirejtshuk, 1996: 23.

Facies (Pl. V. Fig. 27, 28) oblong-ovate, subdepressed, somewhat shiny, color yellowish-brown; finely punctate dorsum, cuticle with moderately dense, decumbent pubescence.

Head transverse, about 1.2x as broad as long, frons slightly depressed; punctures on vertex fine, round, separated by about 1-2 diameters of puncture; pubescence moderately long and dense; eyes moderately large, finely faceted, about 0.5x as long as head, temple short, extending beneath eye about three-fourth of ocular width, tip pointed. Antenna about 1.5x as long as head; antennal club slightly darker than remaining segments, about 0.3x as long as antenna, about 1.4x as long as broad, scape broadly elongate.

Prothorax transverse (1.0: 1.7), narrower anterad, anterior margin emarginated; sides arcuate, posterior margin slightly tri-sinuate, anterior angles obtusely rounded, posterior angles nearly right angled. Pronotum slightly convex, surface distinctly punctate, punctures round, slightly coarser than those on vertex, about 1-2 diameters apart, surface with microreticulations; pubescence moderately long, dense, decumbent, posteriorly directed.

Scutellum transverse, about 1.3x as broad as long, triangular with pointed apex; punctures as large as those on pronotum, separated by about

0.5–1 diameters; pubescence short and fine. **Elytra** about as long as broad, with microreticulations, anterior margin closely fit with posterior margin of prothorax and slightly narrower than prothoracic base, humeral angles almost right angled, sides arcuate, borders slightly explanate, apices separately rounded; punctures confused, round, separated by 1–3 diameters; pubescence moderately dense, long, decumbent, directed posterad. Exposed tergites of abdomen about 1.3x as broad as long, abdomen in male bears an additional sclerite which is both dorsally and ventrally visible, punctures small, round, separated by about 1-2 diameters; pubescence rather short, uniformly arranged, closely appressed to the surface of the abdomen, posteriorly directed.

Legs moderately long and slender; hind tibiae in males slender at the basal one-third with sudden expansion at the apical two-third of the tibiae.

Ventral side uniformly dark brown; gular region of head with posteriorly converging antennal grooves. Prosternal projection narrow between the procoxae with a depressed, broad, bulbous apex; mesoventrite transverse, glabrous; metaventrite punctate-pubescent.

Aedeagus (Pl. V. Fig. 29-34): Elongate, somewhat lance-shaped median lobe broadest medially, with a longitudinal furrow extending from apex towards middle. Single long median strut. Tegmen with broadly elongate, paired parameres, slightly bent and converge apically. No distinct tegminal strut from extremities of anterior margin.

Measurements (in mm.): Total length 2.42–2.78, width of head across eyes 0.44–0.45, length of antenna 0.53–0.58, length and width of prothorax 0.64–0.66 and 1.11–1.14, length and width of elytra together 1.13–1.15 and 1.06–1.14.

Material examined: 4 exs., 2♂, 2♀, INDIA: Assam, Cachar Distt., Bhagabazar [25.566855° N, 91.892372° E], 27.ii.2014, J. Dasgupta, *ex*. Rotten vegetables. 2 exs., 1♂, 1♀, Assam, Dibrugarh, Marwari patty, Hanuman Temple [27.48479° N, 94.90192° E], 22.ii.2014, J. Dasgupta, *ex*. Rotten fruit.

PLATE- I

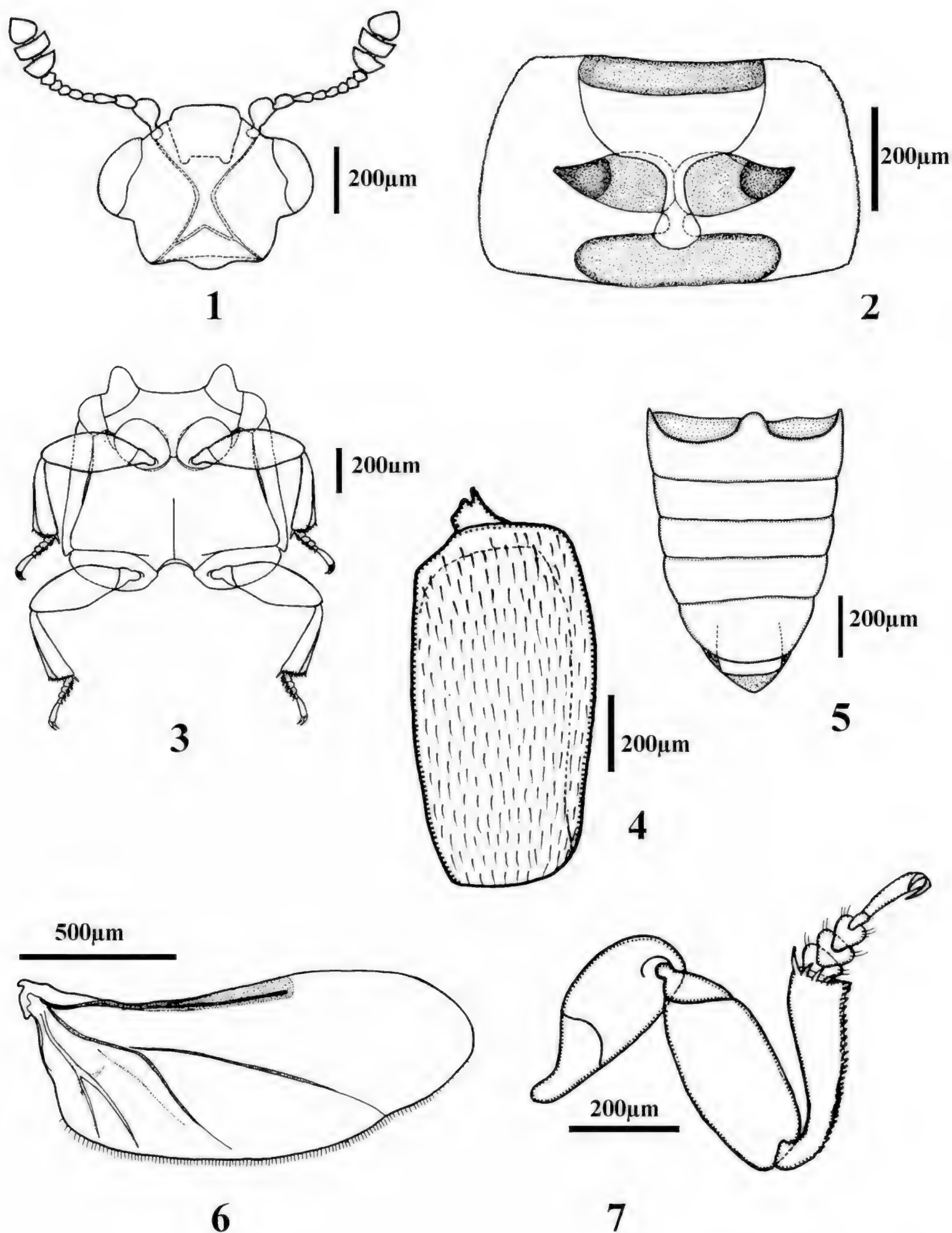


PLATE I. Figs. 1–7. *Epuraea (Haptoncurina) motschulskyi* (Reitter, 1873): 1, Head, Dorsal view; 2, Prothorax, Ventral view; 3, Meso-metathorax, Ventral view; 4, Right elytron, Dorsal view; 5, Abdomen, Ventral view; 6, Wing; 7, Front leg.

PLATE- II

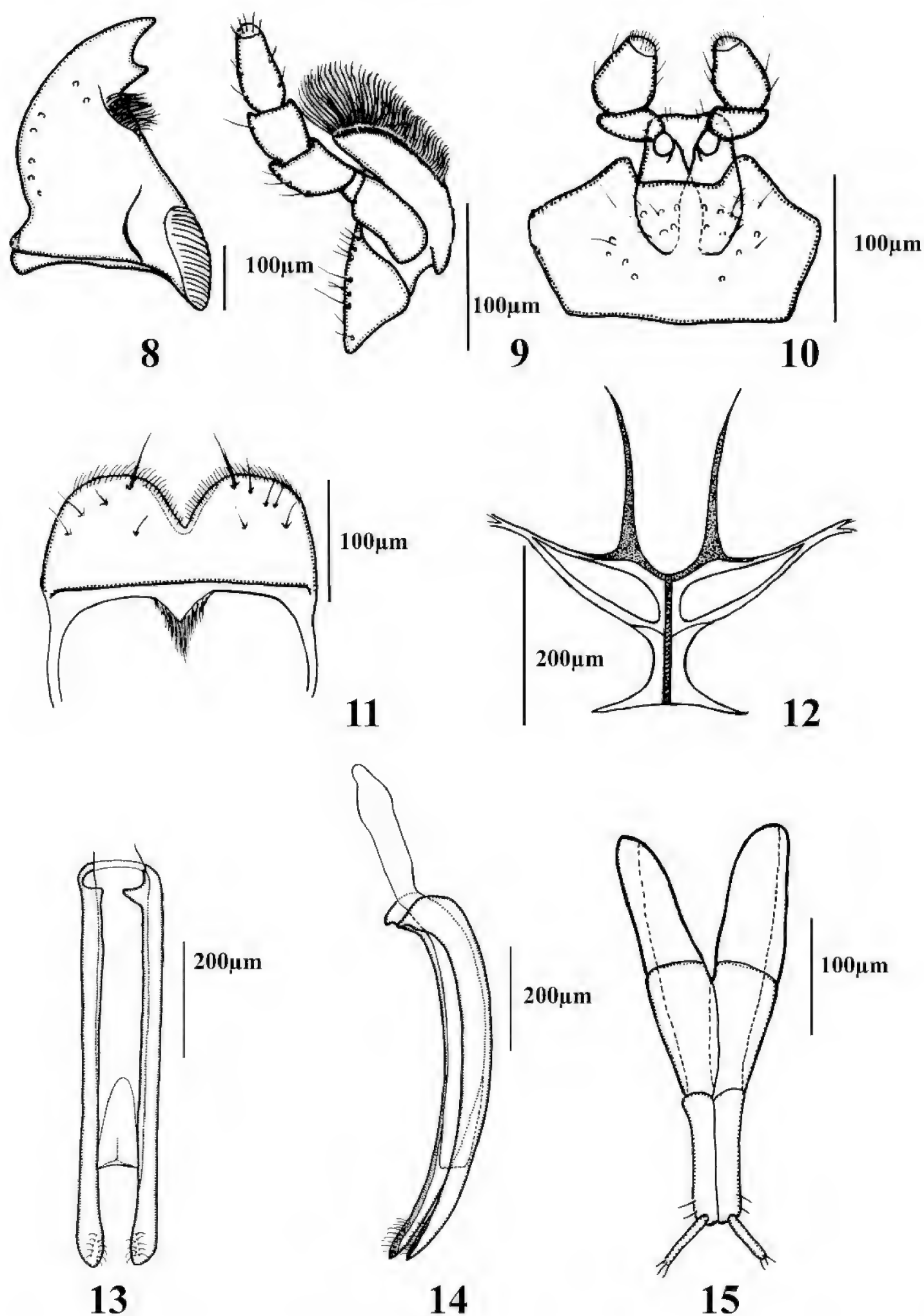


PLATE II. Figs. 8–15. *Epuraea* (*Haptoncurina*) *motschulskyi* (Reitter, 1873): 8, Mandible, Dorsal view; 9, Maxilla, Ventral View; 10, Labium, Ventral view; 11, Labrum, Dorsal view; 12, Metendosternite; 13, Male genitalia, Ventral view; 14, Male genitalia, Lateral view; 15, Ovipositor.

PLATE-III



16



17



18



19

PLATE III. Figs. 16–19. *Epuraea* (*Haptoncurina*) *motschulskyi* (Reitter, 1873) (Photographs): 16, Dorsal figure; 17, Ventral figure; 18, Tegmen of male genitalia; 19, Median lobe of male genitalia.

PLATE- IV

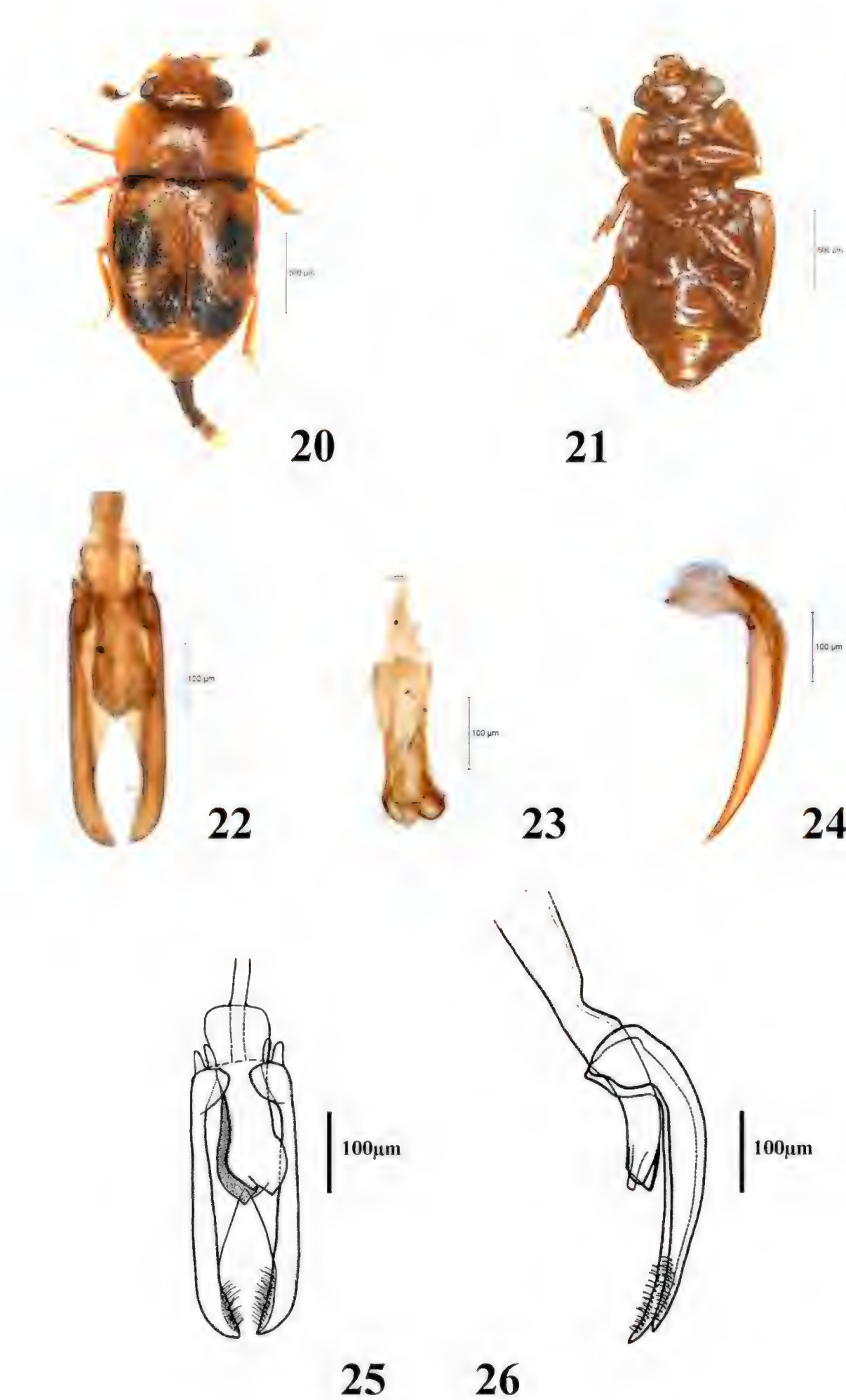


PLATE IV. Figs. 20–26. *Epuraea* (*Haptoncus*) *ocularis* Fairmaire, 1849: 20, Dorsal figure (Photo); 21, Ventral figure (Photo); 22, Male genitalia, Ventral view (Photo); 23, Median lobe, Ventral view (Photo); 24, Tegmen, Lateral view (Photo); 25, Male genitalia, Ventral view (Line drawing); 26, Male genitalia, Lateral view (Line drawing).

PLATE- V

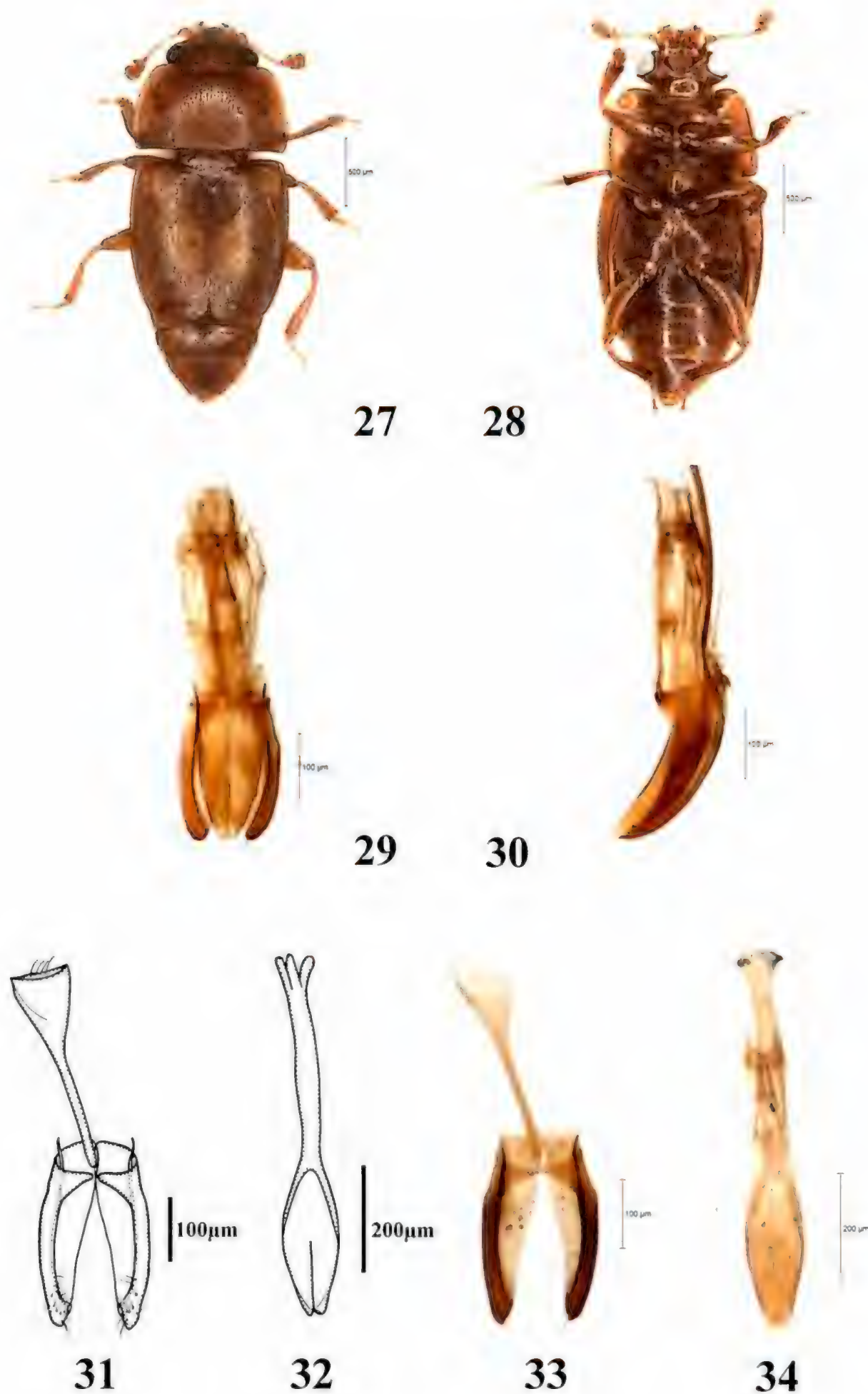


PLATE V. Figs. 27–34. *Epuraea (Haptoncus) luteola* Erichson, 1843: 27, Dorsal figure (Photo); 28, Ventral figure (Photo); 29, Male genitalia, Ventral view (Photo); 30, Male genitalia, Lateral view (Photo); 31, Tegmen, Ventral view (Line drawing); 32, Median lobe, Ventral view (Line drawing); 33, Tegmen, Ventral view (Photo); 34, Median lobe, Ventral view (Photo).

Distribution: INDIA: Assam (New record), Rajasthan, Uttar Pradesh, West Bengal, Tamil Nadu, Maharashtra, Orissa, Karnataka, Kerala; PAKISTAN; NEPAL; THAILAND; VIETNAM; MALAYSIA; PHILIPPINES; LAOS; SRI LANKA; SINGAPORE; INDONESIA; CELEBES; NEW GUINEA; AFRO-TROPICAL REGION; CAPEAN REGION; MADAGASCAREAN REGION; NOVAZEALANDIAN REGIONS; ITALY; ISRAEL; AFGHANISTAN; CHINA; KOREA; JAPAN; USA; AUSTRALIA; BRAZIL; CUBA; DOMINICAN REPUBLIC; POLYNESIA.

**3. *Epuraea (Haptoncus) ocularis*
Fairmaire, 1849**

Epuraea ocularis Fairmaire, 1849: 363; Reitter, 1873: 27; Reitter, 1880b: 508; Kraatz, 1895: 148.

Epuraea bisignata Boheman, 1851: 565.

Nitidula significans Walker, 1858: 206; Olliff, 1885: 70.

Haptoncus tetragonus Murray, 1864: 401; Sharp, 1878: 139; Olliff, 1885: 70; Sharp, 1908: 508; Reitter, 1880b: 508; Reitter, 1884: 259; Grouvelle, 1903: 113; Grouvelle, 1913: 97.

Epuraea decorata Reitter, 1873: 28, 41.

Epuraea thiemei Reitter, 1873: 28, 41; Reitter, 1884: 260.

Haptoncura ocularis: Reitter, 1875a: 62; Blackburn, 1902: 306; Blackburn, 1903: 116.

Haptoncura thiemei: Reitter, 1884: 260.

Haptoncus significans: Olliff, 1885: 70; Grouvelle, 1913: 97.

Epuraea bifasciata Kraatz, 1895: 148.

Haptoncus ocularis: Fauvel, 1903: 301; Grouvelle, 1908: 343, 345; Nakane, 1959: 56; Hisamatsu, 1960: 2; Gillogly, 1962: 176; Jelínek, 1977: 394; Hayashi, 1978: 15, 33; Gillogly, 1982: 287; Endrödy-Younga, 1982: 269; Hisamatsu, 1985: 180.

Haptoncus decorates: Fauvel, 1903: 301; Grouvelle, 1906c: 75; Grouvelle, 1913a: 97; Grouvelle, 1913b: 106.

Haptoncus bifasciatus: Grouvelle, 1912: 395.

Epuraea bohemani Plaviltschikov, 1924: 232.

Haptoncus barbulus Gillogly, 1962: 172; Gillogly, 1969: 247; Gillogly, 1982: 287.

Epuraea (Haptoncus) ocularis: Kirejtshuk, 1992: 122; Kirejtshuk, 1996: 24.

Facies (Pl. IV. Fig. 20, 21) elongate-ovoid, subdepressed, rather shiny, head and prothorax yellowish, yellowish elytra with characteristic blackish patches; cuticle with golden yellow, short, decumbent pubescence.

Head transverse, about 1.4x as broad as long, frons slightly depressed; punctures on vertex minute, round, separated by about 0.75-2 diameters of puncture; eyes large, moderately projected, moderately coarsely faceted; rounded outer margin, about 0.4x as long as head, temple extended beneath posterior margin of the eye. Antenna about 1.9x as long as head; antennal club about 1.4x as long as broad, segments somewhat closely attached, about 0.26x as long as antenna.

Prothorax transverse (1.0: 1.8), slightly broader posteriorly, anterior margin deeply emarginate; sides arcuate, weakly rounded posterior margin with feeble sinuation on either side of middle, anterior angles broadly pointed, posterior angles prominent, nearly right angled. Pronotum moderately convex, surface punctate, punctures round, somewhat densely arranged, about 0.5-1 diameters apart, surface alutaceous; pubescence golden yellow, moderately long and thick, decumbent, posteriorly directed.

Scutellum transverse, about 0.7x as broad as long, dark, triangular with pointed apex; punctures separated by about 0.5-1 diameters; pubescence short and fine.

Elytra about as long as broad, with microreticulations, feebly elongate, base closely fit with posterior margin of prothorax and about as broad as prothoracic base, with two small dark basal patches close to humeral angles, two elongate-oval sublateral dark patches near middle and two semicircular transverse dark apical patches; humeral angles prominent, almost right angled, sides uniformly arcuate and borders slightly explanate, apices separately rounded; punctures slightly coarser than those on pronotum, elongate-oval, somewhat shallow, separated by 0.75-1 diameter; pubescence moderately dense, long and thick, decumbent, directed posterad. Exposed tergites of abdomen about 1.2x as broad as long, abdomen in male bear additional sclerite which is both dorsally

and ventrally visible, punctures small, round, separated by about 3-4 diameters; pubescence rather short, uniformly arranged, closely appressed to the surface of abdomen, posteriorly directed.

Legs moderately long and slender.

Ventral side uniformly testaceous yellow; gular region of head with posteriorly converging antennal grooves. Prosternal projection narrow between the procoxae with a depressed, broad, bulbous apex; mesoventrite transverse, glabrous; metaventrite punctuate-pubescent.

Aedeagus (Pl. IV. Fig. 22-26): Elongate pear-shaped median lobe with arcuate sides, a single long median strut; tegmen with broadly elongate paired parameres, broader basal half, apices bent and converge like closing ends of a gripping clip, with two horn-like tegminal struts from extremities of anterior margin of the ventral face of each paramere; parameres in lateral view considerably bent, narrowed towards apices behind basal third, apices moderately pointed, and studded with moderately long setae on inner borders of apical third.

Measurements (in mm.): Total length 2.01–2.16, width of head across eyes 0.40–0.42, length of antenna 0.52–0.59, length and width of prothorax 0.50–0.53 and 0.92–0.98, length and width of elytra together 1.01–1.07 and 0.98–1.08.

Material examined: 4 exs., 2♂, 2♀, INDIA: Assam, Cachar Distt., Bhagabazar [25.566855° N, 91.892372° E], 27.ii.2014, J. Dasgupta, *ex*. Rotten vegetables; 2 exs., ♂, Assam, Dibrugarh, Marwari patty, Hanuman Temple [27.48479° N, 94.90192° E], 22.ii.2014, J. Dasgupta, *ex*. Rotten fruit; 9 exs., 4♂, 5♀, Assam, Assam University, Silchar [24.68674° N, 92.75306° E], 27.ii.2014, J. Dasgupta, *ex*. Rotten fruit.

Distribution: INDIA: Rajasthan, Uttar Pradesh, West Bengal, Sikkim, Assam, Kerala, Tamil Nadu; NEPAL; MYANMAR; THAILAND; LAOS; VIETNAM; SRI LANKA; MALAYSIA; INDONESIA; PAPUA NEW GUINEA; AFRICAN PART OF MEDITERRANEAN PROVINCE; JAPAN; KOREA; CHINA; TAIWAN; TOGO; CAMEROON; TANZANIA; UGANDA;

ZAIRE; ANGOLA; NAMIBIA; MALAWI; SOUTH AFRICA; MADAGASCAR; RÉUNION; SEYCHELLES; MICRONESIA; AUSTRALIA; NEW CALEDONIA; USA (introduction from Taiwan or Japan).

4. *Epuraea (Micruria) viraktamathi*
Dasgupta, Pal and Hegde sp. n.
(Fig. 35–42, 50)

[urn:lsid:zoobank.org:act:3040FA11-D73A-4D27-893C-38B6566320AD](https://zoobank.org/urn:lsid:zoobank.org:act:3040FA11-D73A-4D27-893C-38B6566320AD)

Facies (Pl. VI. Fig. 35, 36) oblong-ovate, somewhat convex, moderately shiny, uniformly dark brown; cuticle with golden yellow, short, decumbent pubescence.

Head transverse, about 1.4x as broad as long, frons slightly depressed; punctures on vertex minute, round, separated by about 1–2 diameters of puncture; eyes moderately large, finely faceted, about 0.4x as long as head, temple short and sloped behind; pubescence near eyes short, sparse and decumbent. Antenna about 1.5x as long as head; antennal club about 1.1x as long as broad, segments somewhat closely attached, about 0.28x as long as antenna.

Prothorax transverse, (1.0: 1.8), wider posteriorly, anterior margin deeply emarginate; sides feebly arcuate, posterior margin bisinuate on either side of middle, anterior angles obtusely rounded, posterior angles acute and somewhat pointed. Pronotum moderately convex, borders slightly explanate, surface distinctly punctate, small punctures coarsely arranged, about 1–2 diameters apart, surface with microreticulations; pubescence moderately long and thick, decumbent, posteriorly directed.

Scutellum transverse, about 1.5x as broad as long, triangular with slightly curved sides and pointed apex; punctures slightly finer than those on elytra, separated by about 1–2 diameters; pubescence short and fine.

Elytra about as broad as long, anterior margin closely fit with posterior margin of prothorax, humeral angles rounded and feebly obtuse, sides uniformly arcuate, borders slightly explanate, apices separately rounded; punctures round, slightly coarser than those on pronotum, separated by 1–2 diameters; pubescence moderately dense, long, decumbent, directed

PLATE- VI

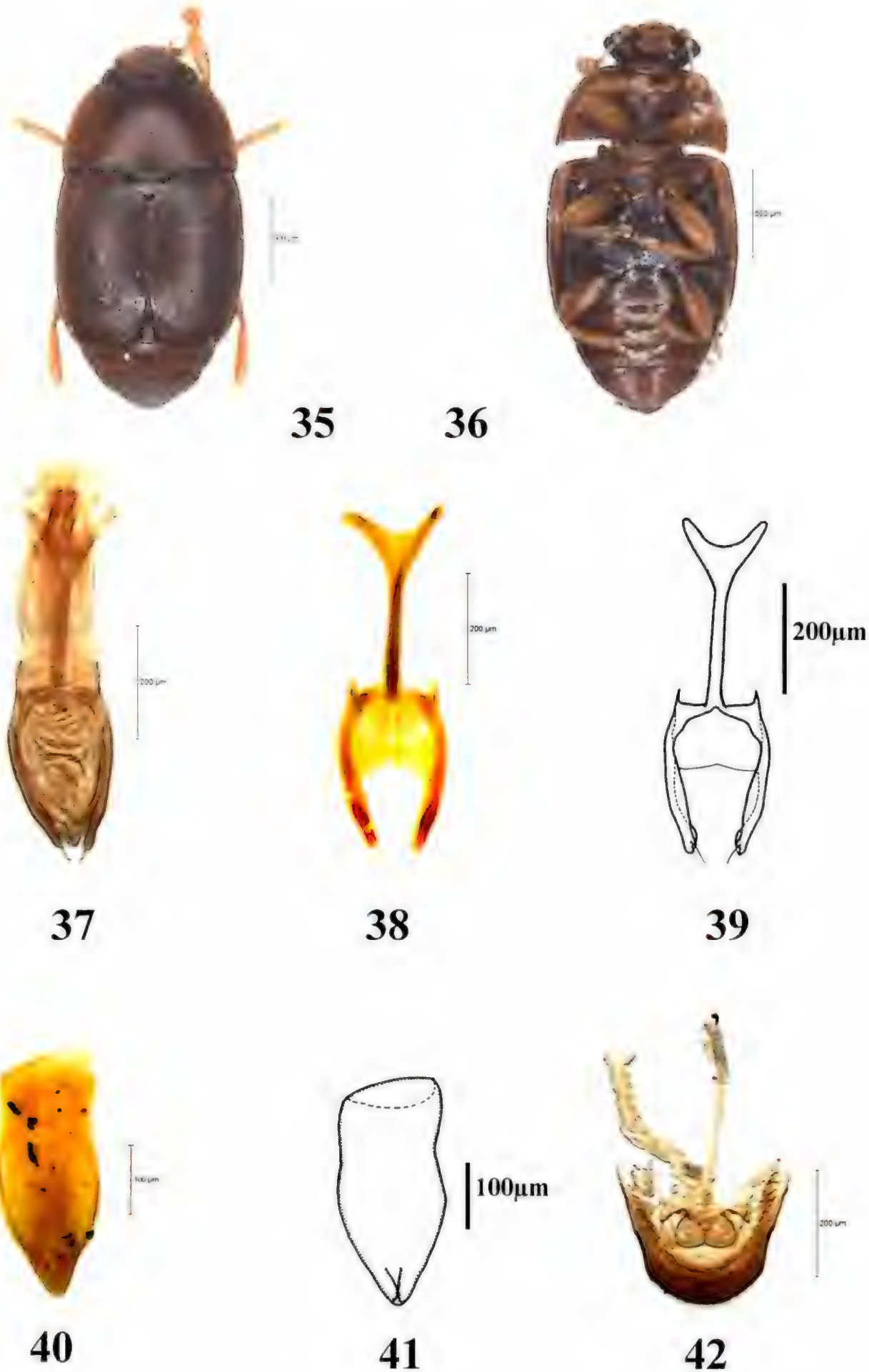


PLATE- VI. Figs. 35–42. *Epuraea viraktamathi* sp. n.: 35, Dorsal figure (Photo); 36, Ventral figure (Photo); 37, Male genitalia, Ventral view (Photo); 38, Tegmen, Ventral view (Photo); 39, Tegmen, Ventral view (Line drawing); 40, Median lobe, Ventral view (Photo); 41, Median lobe, Ventral view (Line drawing); 42, Anal sclerite and spiculum gastrale (Photo).

PLATE- VII

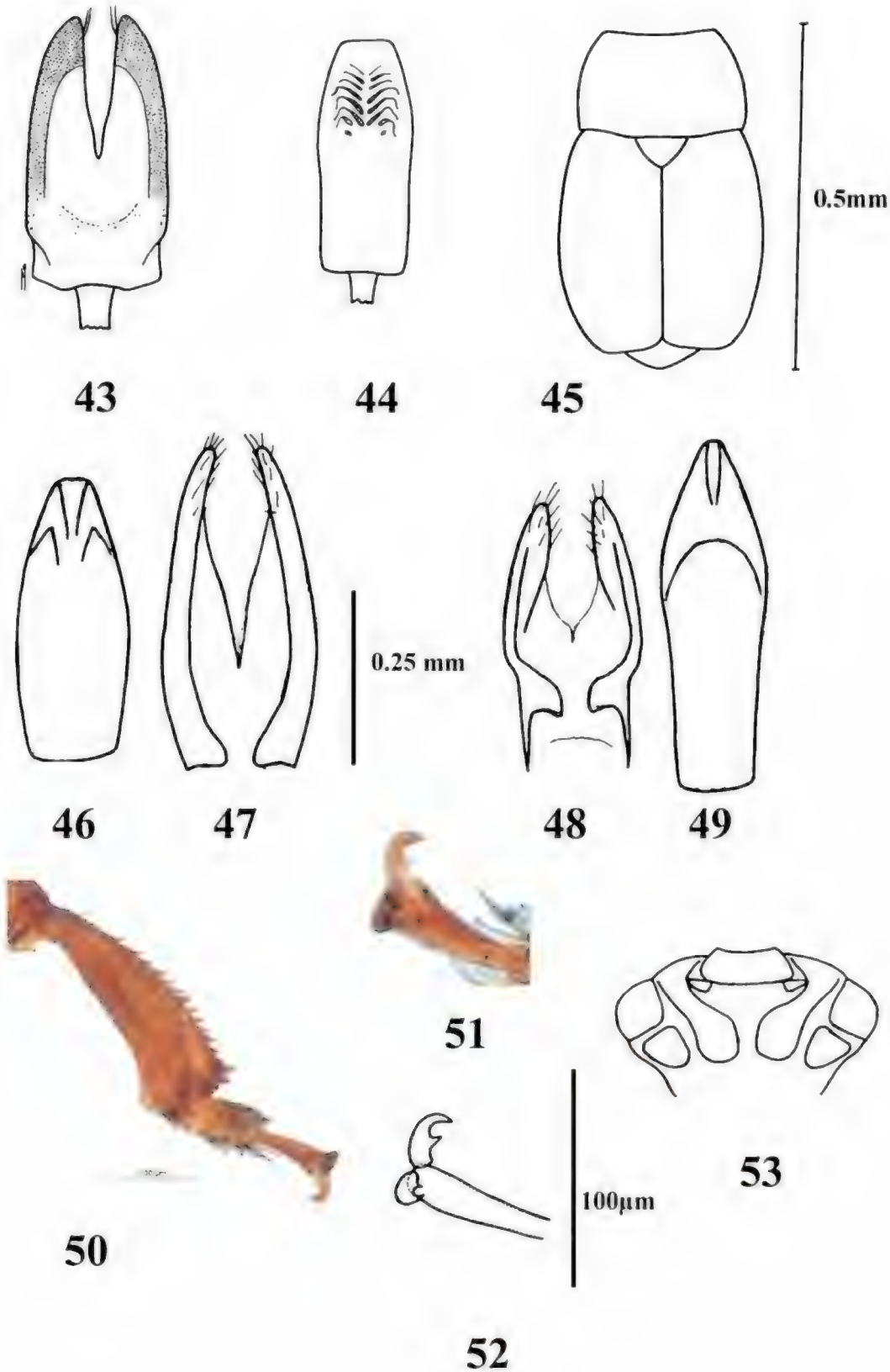


PLATE- VII. Figs. 43–45. *Epuraea (Micrurula) descarpententriesi* Jelínek (= *E. (Micruria) subtilis* sensu Kirejtshuk, 1998) [derived from Jelínek, 1978]: 43, Tegmen; 44, Median lobe; 45, Body type. Figs. 46–49. *Epuraea (Micruria) subtilis* Grouvelle (derived from Kirejtshuk, 1998): 46, Tegmen, specimen from North Vietnam; 47, Median lobe, specimen from North Vietnam; 48, Tegmen, specimen from Malaysia, Malacca; 49, Median lobe, specimen from Malaysia, Malacca. Figs. 50–52. *Epuraea (Micruria) viraktamathi* sp. n.: 50, Mid-tarsi in male (Photo); 51, Toothed claw in midleg (Photo); 52, Toothed claw (line drawing). Fig. 53. *Epuraea (Epuraeanella) hammondi* Kirejtshuk, 1992 (derived from Kirejtshuk, 1998): Ventral surface of head with a contour of antennal grooves and postocular fossae.

posterad. Exposed tergites of abdomen about 1.6x as broad as long, abdomen in male with additional sclerite, visible both dorsally and ventrally, punctures small, round, about 0.5x as coarse as those on elytra, separated by about 1–3 diameters; pubescence very short, uniformly arranged, closely appressed to surface of abdomen, posteriorly directed.

Legs with mid tibiae distinctly curved near apex in male (Pl. VII. Fig. 50).

Ventral side uniformly reddish brown; gular region of head with posteriorly converging antennal grooves. Prosternal projection narrow between procoxae, with a depressed, broad, bulbous apex; mesoventrite transverse with a median longitudinal carina; metaventrite densely punctuate and moderately pubescent.

Aedeagus (Pl. VI. Fig. 37-41): Elongate pear-shaped median lobe with arcuate sides and a single median strut that bifurcates at the apex; tegmen with paired C-shaped parameres with broader basal half, apices bent and converge like a sac.

Measurements (in mm.): Total length 2.12–2.21, width of head across eyes 0.37–0.39, length of antenna 0.43–0.45, length and width of prothorax 0.52–0.57 and 0.97–1.07, length and width of elytra together 1.03–1.05 and 1.09–1.14.

Material examined: Holotype ♂, INDIA: Assam, Jorhat, Toklai Tea Research Station, 27.i.2014, Collector (?), ex. Tea flower (*Camellia sinensis* var. *assamica* (L.) Kuntze); Paratype 3 ♀, same data as holotype.

Distribution: INDIA: Assam.

Etymology: The species is named in honor of renowned entomologist, Prof. C. A. Viraktamath, for his support to one of the authors (JD) in this study. The material of the species was received from Prof. Viraktamath.

Comparative note: This species shows some resemblance with *Epuraea* (*Micruria*) *subtilis* Grouvelle, 1894 based on the drawing of the male genitalia (Pl. VII. Fig. 46-49), elytra being twice as long as wide, posterior margin of pronotum bi-sinuate with hind corners projecting posteriorly and its record from Assam (see

Kirejtshuk, 1998) but can be differentiated by the presence of distinct curvature in the mid-tibiae in males in form of secondary sexual dimorphism (vs. absence of any distinct curvature in mid-tibiae in males of *Epuraea* (*M.*) *subtilis*). Moreover, there is some ambiguity regarding the synonymization of *Epuraea* (*Micruria*) *subtilis* Grouvelle, 1894 with *Epuraea* (*Micrurula*) *descarpententriesi* Jelínek, 1978 as the drawing of the male genitalia by Jelínek (1978) (Pl. VII. Fig. 43, 44) hardly coincides with that of Kirejtshuk (1998). The species also bear certain resemblances with *Epuraea* (*Micruria*) *consanguinea* Grouvelle, 1914 in the shape of the body, shape of the tegmen of male genitalia (see Kirejtshuk, 1998), body color ranging from brownish-reddish to chestnut-brown, elytral length about 1 mm., but can be differentiated by its distribution in Assam, posterior margin of pronotum emarginated and posterior corners pointed, elytra about as broad as long combined, median lobe elongate pear-shaped and tegmen with horn-like process [vs. distribution restricted to Taiwan, posterior margin of pronotum without emargination, elytra longer than combined width, median lobe of male genitalia cylindrical with sudden convergence towards apex with apical tip truncate, tegmen devoid of horn-like processes in *Epuraea* (*Micruria*) *consanguinea*].

Discussion

It appears to us that Assam and Northeastern states bear a considerably rich fauna of sap beetles but yet not sufficiently worked out. More intensive surveys in different bioclimatic zones of Assam are necessary to explore more forms which are not known yet. The redescrptions of the already known species could be taken up with more material available for study. Redescription of the genus *Epuraea* Erichson on the basis of reevaluated characters points out its close affinity with *Carpophilus* Stephens of *Carpophilinae*. The character states of different subgenera need to be taken up so as to find out inter-relationships among them. The presence of *Epuraea* (*Micruria*) *viraktamathi* sp. n. in flower of tea plants only makes an interesting note. Its significance for the tea cultivation may be a point of enquiry in further study.

Acknowledgements

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Additions to the knowledge of the genus *Allorhynchium* van der Vecht from the Indian subcontinent with the description of a new species from Kerala (Hymenoptera: Vespidae: Eumeninae)

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Abstract

A new species of *Allorhynchium*, namely, *A. tuberculatum* Girish Kumar and Carpenter sp. n., is described from Thattekkad Bird Sanctuary, Kerala. The male of the species *A. anomalum* Giordani Soika, 1992, is described here for the first time. A key to species from the Indian subcontinent and an updated checklist of Oriental species are provided.

Keywords: *Allorhynchium*, new species, key, checklist, Kerala, Indian subcontinent.

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Introduction

The potter wasp genus *Allorhynchium* van der Vecht, 1963, (Hymenoptera: Vespidae: Eumeninae) is distributed in the Australian, Oriental and Palearctic Regions. Sixteen species with additional four subspecies are recorded under this genus from the Oriental Region of which four species namely, *Allorhynchium anomalum* Giordani Soika, 1992, *A. argentatum* (Fabricius, 1804), *A. lugubrinum* (Cameron, 1900) and *A. metallicum* (de Saussure, 1852), are recorded from the Indian subcontinent. In this paper, we are describing a new species which was collected in dense forest patch of Thattekkad Bird Sanctuary, Kerala. The male of the species *A. anomalum* Giordani Soika, 1992, is described here for the first time. A key to species from the Indian subcontinent is provided. An updated checklist of Oriental species is also provided.

Material and Methods

The specimens of the present study were collected in a dense evergreen forest patch of Thattekkad Bird Sanctuary, Kerala, India. They were examined under a LEICA M60 stereozoom microscope and images captured with the camera model LEICA DFC-

450. The holotype of the new species described here is deposited in the 'National Zoological Collections' of the Western Ghat Regional Centre, Zoological Survey of India, Kozhikode (= Calicut), India (ZSIK).

Abbreviations used for the Museums: NMNH = National Museum for Natural History, Post bus 9 517, 2300 RA, Leiden, The Netherlands; ZSIK — Western Ghat Regional Centre, Zoological Survey of India, Kozhikode (= Calicut), India.

Abbreviations used for the terms: H = Head; M = Mesosoma; OOL = Ocellocular distance; POL = Post ocellar distance; S = Metasomal sternum; T = Metasomal tergum.

Results

Key to species of the genus *Allorhynchium* van der Vecht, 1963, from the Indian subcontinent

(Modified from Girish Kumar and Sharma, 2015)

1. Median area of clypeus strongly punctate, diameter of punctures distinctly more than distance between punctures, interspaces almost carinate; dorsomedian area of T1 and T2 strongly punctate, diameter of punctures more than distance between punctures; metasoma not entirely black,

apex of T1 and T2 with yellow bands (sometimes medially interrupted); tegula reddish brown.....*A.lugubrinum* (Cameron)

- Median area of clypeus not strongly punctate, diameter of punctures almost equal to or less than distance between punctures, interspaces not carinate; dorsomedian area of T1 and T2 weakly punctate or almost absent, if present, diameter of punctures equal to or less than distance between punctures; metasoma entirely black; tegula black. 2
- 2. T1 and T2 with very small, sparse and very shallow punctures except at lateral and apical portions strongly punctured. *A.metallicum* (de Saussure)
- T1 and T2 with medium-sized punctures, interspaces in average equal to punctures, punctures of almost uniform density and thickness except at lateral and apical portions strongly punctured. 3
- 3. Clypeus, in male, with a tuberculate projection towards its apical half (Fig. 3); a narrow transverse yellowish white band present at base of clypeus. [only the male is available for this species] *A.tuberculatum* Girish Kumar and Carpenter sp. n.
- Clypeus, in male, without any tuberculate projection (Fig. 8); clypeus either entirely black or entirely yellow. [if the female of *tuberculatum* is found, then it may go to couplet 4] 4
- 4. Clypeus weakly emarginated at apex in female; dorsal surface of propodeum placed at a level well below that of dorsal surface of metanotum; S2 strongly convex in basal half; clypeus, in male, entirely black; uplifted basal area of S7 not entire, interrupted at middle..... *A. anomalum* Giordani Soika
- Clypeus strongly emarginated at apex in female; dorsal surface of propodeum placed almost at the same level of dorsal surface of metanotum; S2 not so strongly convex in basal half; clypeus, in male, entirely yellow; uplifted basal area of S7 entire, not interrupted at middle..... *A. argentatum* (Fabricius)

Allorhynchium tuberculatum Girish Kumar and Carpenter sp. n.
(Figs. 1-6)

[urn:lsid:zoobank.org:act:2005951C-44A04DBD-8992-9A0B8DCF692E](https://zoobank.org/urn:lsid:zoobank.org:act:2005951C-44A04DBD-8992-9A0B8DCF692E)

Description: Holotype Male (Fig. 1): Body length (H+M+T1+T2) 10 mm; forewing length 9 mm. Body black with the following whitish yellow markings: a transverse band at base of clypeus; a line in between antennal toruli and inner eye margin. Tarsal claws blackish brown. Wings slightly dark with purple reflections. Body with rather sparsely to moderately dense fine silvery white pubescence, head rather strongly pubescent.

Head: 1.17x as wide as long in front view (Fig. 2); clypeus (Fig. 3) broadly pyriform, with a strong tuberculate projection towards apical half, and strongly emarginated apex, maximum width of clypeus 1.14x length medially, with moderately strong punctures, the distance between the punctures in general about as long as diameter of punctures; labrum elongate, rounded at apex; a short but distinct strong carina present at the middle of interantennal space; frons, vertex and temple with close, strong and pit-like punctures, diameter of the punctures greater than distance between the punctures; ocular sinus with strong punctures except at margins; area between the antennal toruli and inner eye margin smooth; POL as long as OOL; diameter of anterior ocellus as long as distance between anterior ocellus and posterior ocelli; temple 0.79x as wide as eye in profile (measured through its ocular sinus); interocular distance 1.20x greater on vertex than at clypeus; occipital carina complete and narrowed ventrally. Antenna (Fig. 4) with the last segment hooked apically and almost reaching the apex of tenth antennal segment in curved position.

Mesosoma: Anterior face of pronotum smooth without punctures; pronotal carina strong, complete; posterior face of pronotum, mesoscutum and scutellum with strong and close rugose punctures; lateral sides of pronotum with transverse striations; median length of mesoscutum 0.91x as long as its maximum width; metanotum not gibbous, strongly and irregularly punctate, interspaces carinate; propleuron almost smooth; mesopleuron with strong and deep rugose punctures except epicnemium and posterior margin smooth; epicnemial carina present; upper metapleuron with a few strong

Plate I



Figs. 1–6. *Allorhynchium tuberculatum* sp. nov. ♂. 1. Body profile; 2. Head frontal view; 3. Clypeus; 4. Antenna; 5. Metanotum and Propodeum; 6. Apical sternites.

Plate II



Figs. 7–12. *Allorhynchium anomalum* Giordani Soika ♂. 7. Body Profile; 8. Head frontal view; 9. Apical antennal articles; 10. Head and mesosoma dorsal view; 11. Metasoma dorsal view; 12. Apical sternites.

transverse striations, lower metapleuron almost smooth with weak transverse striations and few punctures. Propodeum (Fig. 5) vertical, concave posteriorly, declivity of propodeum not bordered dorsally by a carina, dorsolateral margin of propodeum somewhat rounded, dorsolateral area very strongly punctate and irregularly rugose, interspaces carinate, with a few teeth-like structures behind metanotum, posterior concave area of propodeum with a few weak transverse striations, median carina present which runs upwards in to a deep oval fovea, a small median carina present behind metanotum, lateral sides of propodeum strongly rugosely punctured in upper half, weakly punctured to irregularly transversely striate in lower half except at posterior margin, smooth. Tegula micropunctate, not evenly rounded posteriorly and posteriorly not reaching apex of parategula; axillary fossa elongate. Midtibia with 1 spur. Forewing length 3.23x its maximum width, prestigma 0.49x maximum length of pterostigma, outer vein of third submarginal cell anteriorly very close to apex of marginal cell.

Metasoma: T1 1.66x as wide as long in dorsal view, 0.88x as wide as T2; T1 and T2 with medium-sized, closely arranged and moderately dense punctures; visible part of T3 to T5 and S3 to S5 with close but small punctures; narrow basal part of S1 granulate without transverse striations, posterior transverse area of S1 with rather irregular vertical striations and a weak median carina; S2 with moderately strong and deep punctures; longitudinal carinae in transverse groove at base of S2 strongly developed and rather regular; S7 (Fig. 6) with a distinctly uplifted basal area which is not interrupted at middle.

Female: Unknown.

Material examined: Holotype ♂, INDIA: Kerala, Ernakulum district, Thattekkad Bird Sanctuary, Pullasserikkuthu, 29.x.2015, Coll. K.G. Emiliyamma & Party, Regd. No. ZSI/WGRS/I.R-INV.5007.

Distribution: India: Kerala.

Etymology: The species is named after the word “tuberculate” (itself derived from the Latin tuberculum), in reference to the tuberculate projection towards the apical half

of the male clypeus.

Discussion: This new species differs from all other Indian subcontinent species in having a strong tuberculate projection towards the apical half of the male clypeus.

***Allorhynchium anomalum* Giordani**

Soika, 1992

(Figs. 7-12)

Allorhynchium anomalum Giordani Soika, 1992: 41, 51, female - “S. India: Kerala St., Trivandrum Distr., 900 m, Poonmundi Res.” (NMNH).

Diagnosis: Male (Fig. 7): Clypeus strongly emarginated at apex (Fig. 8); apical antennal segment (Fig. 9) is stout, hooked apically and almost reaches the apex of tenth antennal segment in curved position; dorsal surface of propodeum placed at a level well below that of dorsal surface of metanotum (Fig. 10); metanotum more protruding, with a distinct posterior part; propodeum completely devoid of upper carina, excluding dentiform protrusions behind metanotum; lateral sides of propodeum sharply divided in to a convex upper half with large punctures, which continues on to the dorsal surface, and a lower half perfectly smooth and shiny, forming a broad curve after reaching the lower carina, located on the rear face of propodeum, that lower carina less developed, but still distinct; punctation on T2 fine and moderately dense, with interspaces on average equal to punctures except at lateral and apical margin with strong punctures (Fig. 11); S2 strongly convex at basal half, then sub-flat; uplifted basal area of S7 not entire, interrupted at middle (Fig. 12).

Colour: Body entirely black except tarsal claws blackish brown. Wings slightly dark with violet reflections. Body with rather sparsely to moderately dense fine silvery white pubescence, head rather strongly pubescent.

Size (H+M+T1+T2): Body length (H+M+T1+T2) 8.5 mm; Forewing length 9.5 mm.

Material examined: INDIA: Kerala, Ernakulum district, Thattekkad Bird Sanctuary, Pullasserikkuthu, 1♂, 29.x.2015, Coll. K. G. Emiliyamma & Party, Regd. No. ZSI/WGRS/I.R-INV.4970.

Distribution: India: Kerala.

Remarks: Giordani Soika (1992) originally described this species from “Poonmundi Res. of Trivandrum Distr. [=Thiruvananthapuram district]” of Kerala based on the female. We describe here the male of this species from Thattekkad Bird Sanctuary for the first time and this is the first report of this species after its original description by Giordani Soika (1992). Although we did not see female specimens, the propodeum in the male is just as that described for the female by Giordani Soika, and this distinctive condition leaves no doubt as to the association of the sexes.

Checklist of the Oriental species of the genus *Allorhynchium* van der Vecht, 1963

1. *A. anomalum* Giordani Soika, 1992 — India: Kerala.
2. *A. argentatum* (Fabricius, 1804) — Pakistan; India: Andaman & Nicobar Islands, Arunachal Pradesh, Assam, Chhattisgarh, Himachal Pradesh, Karnataka, Kerala, Meghalaya, Mizoram, Sikkim, Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh, West Bengal; Nepal; Myanmar; Thailand; Laos; Malaysia; Singapore; Indonesia: Sumatra, Java, Bali, Borneo, Sulawesi; Philippines.
3. *A. cariniventre* Giordani Soika, 1986 — Philippines.
4. *A. chinense* (de Saussure, 1862) — China; Taiwan; Vietnam; Philippines.
5. *A. concolor* van der Vecht, 1963 — Indonesia: Java.
6. *A. iridipenne* (Smith, 1861) — Indonesia: Sulawesi, Moluccas; Australia.
- 7a. *A. laminatum laminatum* (Gribodo, 1892) — Indonesia: Sulawesi.
- 7b. *A. laminatum nigrescens* van der Vecht, 1963 — Indonesia: Sulawesi.
8. *A. lugubrinum* (Cameron, 1900) — India: Meghalaya, Sikkim; China.
9. *A. metallicum* (de Saussure, 1852) — Pakistan; India: Andhra Pradesh, Assam, Chhattisgarh, Delhi, Gujarat, Himachal Pradesh, Jharkhand, Karnataka, Kerala, Lakshadweep Islands, Madhya Pradesh, Maharashtra, Manipur, Odisha, Pondicherry, Rajasthan, Sikkim, Tamil Nadu, Uttarakhand, Uttar Pradesh, West Bengal; Sri Lanka; Maldives; Nepal, Myanmar; Malaysia: Sarawak; Indonesia: Moluccas; Taiwan.
10. *A. obscurum* (Smith) — Indonesia: Kalimantan, Sumatra; Malaysia: Sarawak.
11. *A. quadrimaculatum* Gusenleitner, 1997 — Laos.
12. *A. quadrituberculatum* (von Schulthess, 1913) — Philippines.
- 13a. *A. snelleni imitator* van der Vecht, 1963 — Indonesia: Java, Krakatau.
- 13b. *A. snelleni javanum* (de Saussure, 1862) — Indonesia: Java.
- 13c. *A. snelleni snelleni* (de Saussure, 1862) — Vietnam; Indonesia: Sumatra (Bangka, Biliton, Sangiang, Sunda Straits), Java (including Karimunjawa, Bawean, Kangean), Kalimantan; Philippines.
- 14a. *A. tigrinum atripenne* Giordani Soika, 1986 — Indonesia: Java, Bali, Timor.
- 14b. *A. tigrinum tigrinum* van der Vecht, 1963 — Indonesia: Sumba.
15. *A. tuberculatum* Girish Kumar and Carpenter **sp. n.** — India: Kerala.
16. *A. violaceipenne* Gusenleitner, 2003 — Philippines.
17. *A. vollenhoveni* (de Saussure, 1862) — Indonesia: Java, Bali.

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Two new species of *Campsicnemus* Haliday, 1851 from India with notes on some Oriental Dolichopodidae (Diptera)

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Abstract

Two new long-legged fly species *Campsicnemus capellarii* sp. n. and *C. uttarakhandicus* sp. n. from Uttarakhand, India, are described and illustrated. The following recombinations (comb. nov.) are proposed: *Chaetogonopteron glaucum* (Becker, 1924), *Chaetogonopteron intermittens* (Becker, 1924), *Chaetogonopteron obscuratum* (Becker, 1924). New data on the distribution of dolichopodid species in the Assam, Goa, Gujarat, Meghalaya, Orissa, Uttarakhand and West Bengal states of India are presented. *Argyrochlamys impudicus* Lamb, 1922, and *Phoomyia srilankensis* Naglis and Brooks, 2013, are recorded from India for the first time.

Keywords: *Campsicnemus*, new species, new combination, new record, Uttarakhand, India.

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Introduction

The Dolichopodidae fauna of India is poorly known. The major contribution to the fauna was made by Becker (1922). Subsequently, only a few additional species were described and reported from this country. A recently compiled checklist of long legged flies of India (Chakraborty *et al.*, 2015) includes 148 species, but at least 10 species are missing in the list, such as *Chaetogonopteron apicinigrum* Yang and Grootaert, 1999, *C. tarsatum* (Schiner, 1868), *Chrysosoma crinicornis* (Wiedemann, 1824), *C. snelli* Curran, 1927, *Condyllostylus longicornis* (Fabricius, 1775), *Diaphorus nigricans* Meigen, 1824, *Dolichopus plumipes* (Scopoli, 1763), *Medetera austroapicalis* Bickel, 1987, *Sympycnus simplicipes* Becker, 1908, and *Tachytrechus tessellatus* (Macquart, 1842) (see Grichanov, 2014). Also, the authors (Chakraborty *et al.*, 2015) have included in their list several doubtful names, junior synonyms treated as valid, and some species assigned to wrong genera.

The genus *Campsicnemus* Haliday in Walker, 1851 (subfamily Sympycninae) numbers about 310 species with an extremely high diversity of endemic species in the Hawaiian Islands and French Polynesia (Evenhuis, 2009, 2015). The Palearctic region

contains 39 known species (Selivanova *et al.*, 2012). The Oriental and Afrotropical faunas include only 6 and 7 species, respectfully (Grichanov, 2012a, 2014). Previous to this paper, no species of the genus had been reported from India. Five Taiwanese *Campsicnemus* species were described by Becker (1924), and they are all removed from the genus in this paper. Additionally, *Campsicnemus rufinus* Frey, 1925, described from Philippines, is here considered *incertae sedis* within Dolichopodidae.

Below I describe new species *Campsicnemus capellarii* sp. n. and *C. uttarakhandicus* sp. n. from the Uttarakhand state of India. This paper presents also new records for other species of Dolichopodidae from the Assam, Goa, Gujarat, Meghalaya, Orissa, Uttarakhand and West Bengal states of India.

Material and Methods

Morphological terminology mainly follows Cumming and Wood (2009). Body length is measured from the base of the antenna to the posterior tip of epandrium. Wing length is measured from the base to the wing apex. The relative lengths of the tarsomeres should be regarded as

representative ratios and not measurements. Male genitalia were not dissected and figured as they have low taxonomic value in the genus *Campsicnemus* (Evenhuis, 2009, 2015). The holotypes of new species are housed at the Zoological Museum of Moscow State University, Moscow, Russia (ZMUM) and other material examined are at the Zoological Institute of the Russian Academy of Sciences, St. Petersburg (ZIN). Information on collecting circumstances and permits is not available from the ZMUM collection. General distribution of species is given after Grichanov (2014).

DESCRIPTION OF NEW SPECIES

Campsicnemus capellarii Grichanov, sp. n. (Figs. 1–6)

[urn:lsid:zoobank.org:act:E695B2BA-A279-47FA-8FC4-F974EEC1C4A9](https://zoobank.org/urn:lsid:zoobank.org:act:E695B2BA-A279-47FA-8FC4-F974EEC1C4A9)

Description: *Male: Head* (Fig. 1): Frons metallic black, with violet tint; face velvety-brown, narrow, the narrowest in middle, where face as wide as distance between ocellar bristles; clypeus convex; antenna black; postpedicel subtriangular, with rounded apex, slightly longer than high (16/13), with long hairs; arista-like stylus basodorsal, simple, with distinct hairs apically; length ratio of scape to pedicel to postpedicel to stylus, 10/8/16/81; proboscis black; palpus black, with black hairs; lower postocular setae pale brown.

Thorax: Metallic black; mesonotum with bluish shine; pleuron brownish pollinose; 4 pairs of strong dorsocentral bristles; acrostichals uniseriate, well developed; proepisternum with 1 strong black seta and 1-2 dark hairs; scutellum with 2 strong black setae and two pairs of short hairs in middle and laterally.

Legs: Mostly dark; fore coxa orange, black at base; mid and hind coxae black; femora yellow-orange, blackish at distal apex; fore and hind tibiae orange, blackish at base, black at distal apex; mid tibia black; tarsi black, but basitarsi orange at base, coxae with dark hairs and black setae; hind coxa with one outer seta; fore leg simple; fore tibia with 1 strong dorsal bristle at middle; fore tarsomeres 3-5 with somewhat elongate hairs; mid femur (Fig. 2)

with single posterior preapical bristle, with anteroventral row of strong setae, longer than diameter of femur, with several similar posteroventral setae in middle, with ventral row of about 10 short erect hairs preapically, ventrally flattened and glabrous in distal fifth; mid tibia (Fig. 3) slightly curved, slightly thickened at base and at distal apex, constricted at extreme base, with sparse row of short anterodorsal setae, with full row of erect posteroventral setae, nearly as long as diameter of tibia, mainly simple, but flattened on basal thickening, and with 2 apical setae; 3rd-5th segments of mid tarsus (Fig. 4) with long black hairs dorsally; 1 longest hair on apex of 3rd tarsomere, about 2 times as long as 4th segment; hind femur (Fig. 5) with single anterior preapical bristle, with posteroventral row of long setae in distal half, decreasing in length distally, with 3 short erect anteroventral setae at apex; hind tibia with 3 anterodorsals, 3 posterodorsals and 2 short ventrals; tarsus simple; podomeres (from femur to fifth tarsomere) length ratio (in mm): fore leg: 0.99/0.81/0.41/0.29/0.19/0.09/0.16, mid leg: 1.39/1.64/0.55/0.46/0.33/0.19/0.26, hind leg: 0.78/0.79/0.21/0.22/0.18/0.09/0.11.

Wing (Fig. 6): Greyish, mostly hyaline, but with large brown spot in distal half anteriorly, somewhat diffused at apex of R₄₊₅; basal portion of costa almost straight, bearing equal in length setae on 3rd section; R₄₊₅ and M₁₊₂ parallel in apical part; ratio of costal section between R₂₊₃ and R₄₊₅ to that between R₄₊₅ and M₁₊₂, 22/18; basal section of M₁₊₂ shorter than distal section (8/10); ratio of cross-vein dm-cu to distal part of CuA₁, 16/24; lower calypter yellow, with black cilia; haltere orange.

Abdomen: Greenish-black, grey pollinose, with black setae and hairs; hypopygium partly concealed, black; cercus large, black, with short light hairs.

Measurements (mm): Body length 2.5, wing length/width 2.9/1.0, antenna length 0.8.

Female: unknown.

Material examined: *Holotype.* ♂, India: Uttarakhand, 30.41°N, 78.29°E, 2500m, 9-10.ix.2011, N. Vikhrev [ZMUM]. *Paratype.* 1♂, India: Uttarakhand, Chamba, 30.363°N, 78.384°E, 1800 m, 9-10.ix.2011, N. Vikhrev [ZIN].

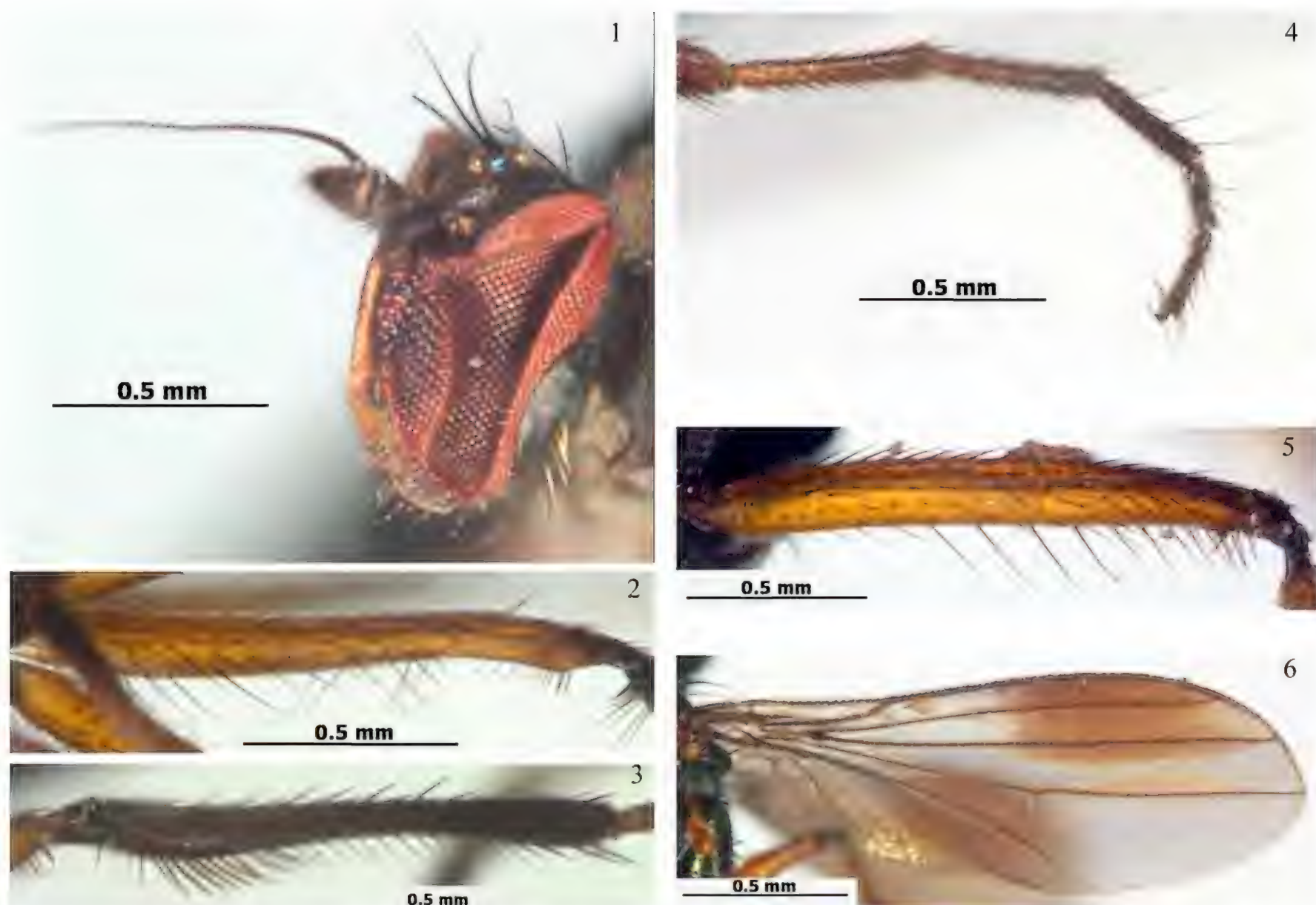


Fig. 1-6. *Campsicnemus capellarii* Grichanov, **sp. n.** (male): 1. Head; 2. Mid femur; 3. Mid tibia; 4. Mid tarsus; 5. Hind femur; 6. Wing.

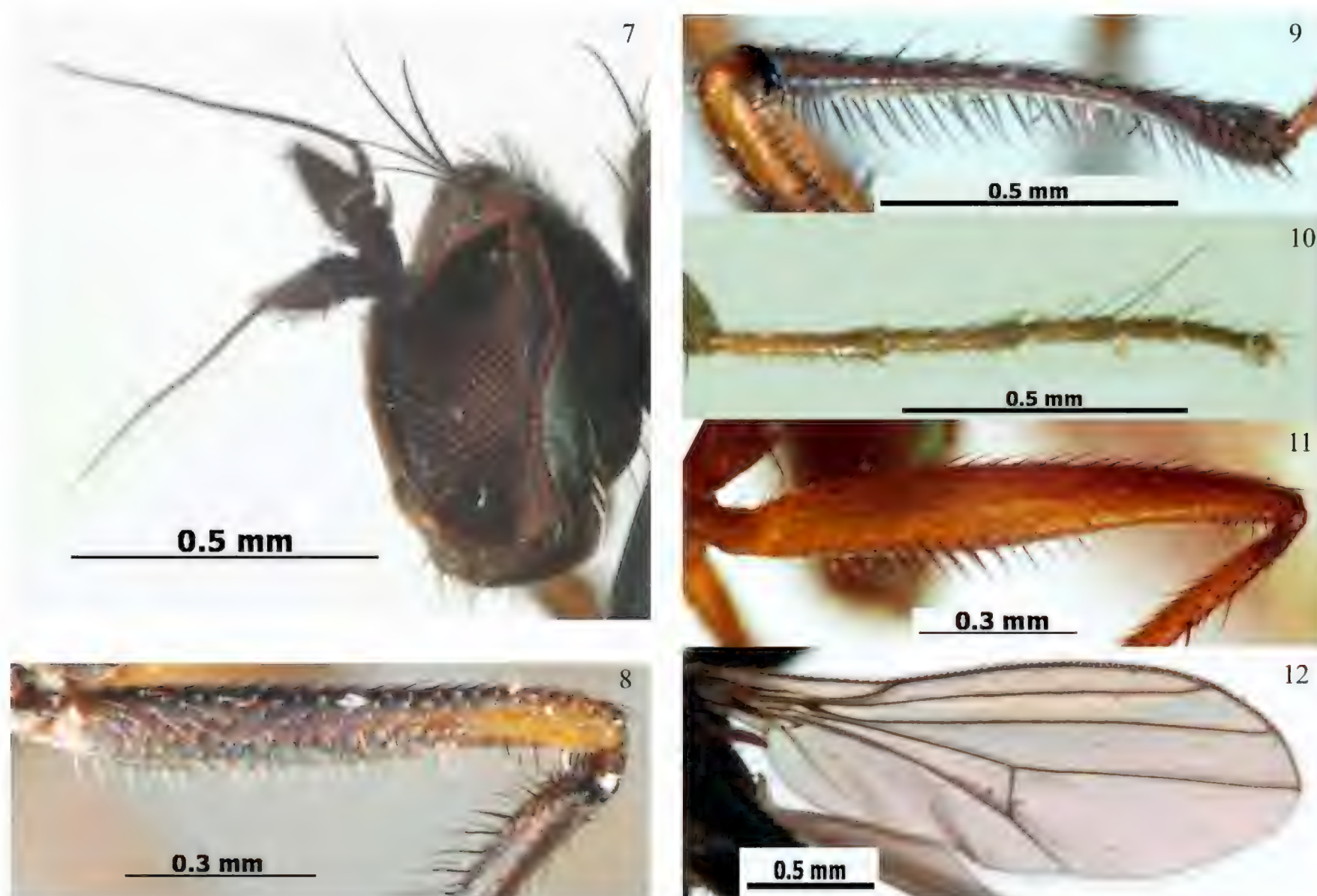


Fig. 7-12. *Campsicnemus uttarakhandicus* Grichanov, **sp. n.** (male): 7. Head; 8. Mid femur; 9. Mid tibia; 10. Mid tarsus; 11. Hind femur; 12. Wing.

Etymology: The species is named after the Brazilian dipterist Dr. R.S. Capellari.

Diagnosis: The new species is close to *C. yunnanensis* Yang and Saigusa, 2001, described from the Yunnan Province of China, and to *C. uttarakhandicus* Grichanov, sp. n., differing from both species in having brown spot on wing, armature of mid leg etc. All three species are related to the *C. armatus* group of species known from the Afrotropical and Palaearctic Regions (Grichanov, 2009, 2012a), being characterized by the modified mid tibia and unmodified mid basitarsus. The Oriental species are closest to the Palaearctic *C. zlobini* Grichanov, 2012, from the Russian Far East, which lacks long cilia on mid tarsus in male (Grichanov, 2012b).

Campsicnemus uttarakhandicus Grichanov,
sp. n.
(Figs. 7–12)

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Description: *Male: Head* (Fig. 7): Frons metallic black, with violet tint; face black, grey pollinose on upper half and brownish pollinose on lower half, narrow, the narrowest in middle, where face half as wide as distance between ocellar bristles; clypeus convex; antenna black; postpedicel subtriangular, with rounded apex, slightly longer than high (14/10), with long hairs; arista-like stylus basodorsal, simple, with distinct hairs apically; length ratio of scape to pedicel to postpedicel to stylus, 8/5/14/62; proboscis black; palpus black, with black hairs; lower postocular setae dirty white.

Thorax: Metallic black; mesonotum with bluish shine; pleuron brownish pollinose; 4 pairs of strong and 1 anterior pair of weak dorsocentral bristles; acrostichals uniseriate, well developed; proepisternum with 1 strong black seta and 1-2 dark hairs; scutellum with 2 strong black setae and two pairs of short hairs in middle and laterally.

Legs: Mostly dark; fore coxa orange on distal half, blackish on basal half; mid and hind coxae black; fore femur mostly black, orange in distal third; mid femur black, orange at distal apex; hind femur orange-brown, blackish dorsally on distal half; fore and hind tibiae orange, black at both apices; mid tibia

black; tarsi black, but basitarsi orange on basal half, coxae with dark hairs and black setae; hind coxa with one outer seta; fore leg simple; fore tibia with 1 strong dorsal bristle at middle; mid femur (Fig. 8) with single posterior preapical bristle, with anteroventral row of setae along entire length except distal apex, nearly half as long as height of femur, with preapical comb of 7 erect ventral setae; mid tibia (Fig. 9) ventrally flattened, anteriorly glabrous, slightly curved, distinctly thickened at base and at distal apex, constricted at extreme base, with sparse row of short dorsal setae, with full double row of simple erect ventral setae, mostly 1.5-2 times as long as diameter of tibia, and with 1 apical seta; apex of 2nd tarsomere and 3rd-5th segments of mid tarsus (Fig. 10) with long black hairs dorsally; 1 longest hair on apex of 3rd tarsomere, about as long as 4-5th segments combined; hind femur (Fig. 11) with single anterior preapical bristle, with anteroventral, ventral and posteroventral rows of setae except base and distal third, about half as long as height of femur, with preapical comb of 6 erect anteroventral setae; hind tibia with 3 anterodorsals, 3 posterodorsals and 2 ventrals; tarsus simple; podomeres (from femur to fifth tarsomere) length ratio (in mm): fore leg: 0.83/0.61/0.39/0.17/0.12/0.10/0.17, mid leg: 1.07/1.00/0.32/0.24/0.15/0.11/0.16, hind leg: 1.15/1.28/0.33/0.35/0.22/0.12/0.15.

Wing (Fig. 12): Greyish, hyaline; basal portion of costa almost straight, bearing equal in length setae on 3rd section; R_{4+5} and M_{1+2} parallel in apical part; ratio of costal section between R_{2+3} and R_{4+5} to that between R_{4+5} and M_{1+2} , 32/26; basal section of M_{1+2} shorter than distal section (9/13); ratio of cross-vein dm-cu to distal part of CuA_1 , 20/33; lower calypter orange, with black cilia; haltere orange.

Abdomen: Greenish-black, grey pollinose, with black setae and hairs; hypopygium partly concealed, black; cercus large, black, with short light hairs.

Measurements (mm): Body length 2.1, wing length/width 2.5/0.8, antenna length 0.75.

Female: Unknown.

Material examined: *Holotype*. ♂, India: Uttarakhand, Rishikesh, 30.1333°N, 78.317°E, forest stream, 15-17.iv.2012, K. Tomkovich [ZMUM]. *Paratype*. 1♂, India: Uttarakhand,

Rishikesh env., Chilla, 29.976°N, 78.209°E, river, about 300m a.s.l., 14-16.iv.2012, K. Tomkovich [ZIN].

Etymology: The species is named after the Uttarakhand state of India.

Diagnosis: The new species is close to *Campsicnemus yunnanensis*, differing from the latter in much darker legs, longer fore tarsus (1.5 times vs. 1.2 times longer than fore tibia), the armature of the mid leg and hind femur etc. *C. yunnanensis* was described with anteroventral setae only on apical portion of mid femur, with 3 apical bristles on mid tibia, with only 2 rows of ventral setae on hind femur, without preapical combs of ventral setae on mid and hind femora (Yang and Saigusa, 2001).

New combinations

***Chaetogonopteron glaucum* (Becker, 1924), comb. nov.**

=*Campsicnemus glaucus* Becker, 1924

=*Sympycnus glaucus* (Becker, 1924) (Negrobov *et al.*, 2007)

Remarks: The species types were examined by Negrobov *et al.* (2007), who recombined it with *Sympycnus* based on the face and hypopygium morphology. However, Becker (1924) described the hind tarsus of his new species with remarkable ornamentations, such as very short subtriangular basitarsus and the next segment short, bearing at apex 2 long bristle-like finely haired processes (“An den Hinterbeinen sind nur die ersten beiden Tarsenglieder verziert; sie sind beide sehr kurz, das erste Glied ist etwas dreieckig, das zweite ist an der Spitze mit 2 borstenartigen Verlängerungen versehen, die ihrerseits wieder an ihrer Spitze fein behaart sind”). These characters clearly refer the species to the current concept of the genus *Chaetogonopteron*, a sister genus to *Sympycnus*. The species was described with remarkable setation on mid tibia and basitarsus, and keys to *C. nanlingense* Zhang, Yang and Grootaert, 2003 (Yang *et al.*, 2011), which is known from the Guangdong Province of China.

Distribution: China, Taiwan.

***Chaetogonopteron intermittens* (Becker, 1924), comb. nov.**

=*Campsicnemus intermittens* Becker, 1924

Remarks: Becker (1924) described the hind tarsus of his new species with very short basitarsus and next segment, the latter bearing erect cilia (“der Metatarsus ist sehr kurz, das zweite Tarsenglied ist ebenfalls sehr kurz und hat abstehende Wimpern”). These characters clearly refer the species to the current concept of the genus *Chaetogonopteron*. The species has also a diagnostic black spot on apical fourth of the wing and keys to *C. menglunense* Yang and Grootaert, 1999 (Yang *et al.*, 2011), which was recently recorded from Taiwan (Wang *et al.*, 2015).

Distribution: China, Taiwan.

***Chaetogonopteron obscuratum* (Becker, 1924), comb. nov.**

=*Campsicnemus obscuratus* Becker, 1924

Remarks: Describing his new species, Becker (1924) noted similarity of *C. obscuratus* with his *C. glaucus*. Becker (1924) described the hind tarsus of the new species with very short subtriangular basitarsus and short next segment, the latter bearing short process (“An den Hinterbeinen sind die beiden ersten Tarsenglieder ebenfalls wie bei der vorigen Art sehr kurz; das erste Glied ist etwas dreieckig und das 2. Glied läuft nicht in 2, sondern nur einen kurzen Zipfel aus”). These characters clearly refer the species to the current concept of the genus *Chaetogonopteron*. The species has also a diagnostic setation on the fore tarsus and mid tibia and keys to *C. menglonganum* Yang and Grootaert, 1999 (Yang *et al.*, 2011), which is known from Yunnan Province of China.

Distribution: China, Taiwan.

Unplaced species

***Campsicnemus halidayi* Dyte, 1975**

=*Campsicnemus maculatus* Becker, 1924 (*nec* Becker, 1918)

Remarks: The species description (Becker, 1924) is unusual for the *Campsicnemus* generic concept in having simple legs of light yellow colour including coxae, but with black-

brown spot on apex of hind femur. Such character as contiguous eyes on lower part of face (“das Untergesicht ist bei fast zusammenstossenden Augen kaum sichtbar”) excludes the species from the genus. So, I consider the species *incertae sedis* within Dolichopodidae.

Distribution: China, Taiwan.

***Campsicnemus lucidus* Becker, 1924**

Remarks: Describing his new species, Becker (1924) noted similarity of *C. lucidus* with his *C. maculatus* (now *C. halidayi*). The shape of male face is not clearly described (“von der Breite des 3. Fühlergliedes”), and apiculiform male cercus is very unusual for the *Campsicnemus* generic concept (“Anhänge klein, etwas spitz vortretend, am Hypopyg einige Borsten”). Therefore, I consider the species *incertae sedis* within Dolichopodidae.

Distribution: China, Taiwan.

***Campsicnemus rufinus* Frey, 1925**

Remarks: The species description (Frey, 1925) is unusual for the *Campsicnemus* generic concept in having simple legs of light yellow colour (including coxae), and large lanceolate postpedicel of antenna, 3 times longer than wide at base, with subapical excavation embracing base of arista (“3. Fühlerglied verhältnismässig gross, lanzettförmig, fast dreimal länger als an der Basis breit, oben vor der Spitze eingeschnitten; in diesem Einschnitte ist die fast nackte Arista inseriert”). Such character as obliterating face (“Untergesicht sehr schmal, Augen unter den Fühlern schmal getrennt”) excludes the species from the genus. So, I consider the species *incertae sedis* within Dolichopodidae.

Distribution: Philippines.

New records

***Argyrochlamys impudicus* Lamb, 1922**

Material examined: 4♂, 1♀, India: Gujarat, Narajan, Sarovar, 23.673°N, 68.532°E, 7-9.x.2012, K. Tomkovich [ZMUM]; 2♀, India: Gujarat, Mandvi env., 22.821°N, 69.364°E,

sandy seashore, 10-13.X.2012, K. Tomkovich [ZMUM].

Distribution: *Afrotropical:* Mauritius, Oman, Seychelles; *Oriental:* Chagos Archipelago, Sri Lanka. New species for India.

***Chrysosoma snelli* Curran, 1927**

Material examined: 1♂, 1♀, India: Goa, Palolem, 15.018°N, 74.018°E, 3-9.ii.2009, K. Tomkovich [ZMUM]; 3♂, India: Goa, Poinguinim, 14.967-6°N, 74.085-6°E, 14-16.ii.2009, pasture, K. Tomkovich [ZMUM].

Distribution: *Afrotropical:* Aldabra, Kenya, Madagascar, Mauritius, Reunion, Rodriguez, Seychelles, Tanzania; *Oriental:* Chagos Archipelago, India (Goa), Maldives.

***Dolichopus exsul* Aldrich, 1922**

Material examined: 1♂, India: West Bengal, Kalimpong (Lower Tanek), 27.06°N, 88.44°E, 625m a.s.l., 1-11.xii.2013, K. Tomkovich [ZMUM]; 2♂, India: Uttarakhand, Haridwar, 29.9954°N, 78.1814°E, 322m, Rajaji Nat. Park, forestry stream, 7-9.v.2012, K. Tomkovich [ZMUM]; 1♂, India: Uttarakhand, Uttarkashi, 30.7266°N, 78.4405°E, 1120m a.s.l., river, yard, 19-25.iv.2012, K. Tomkovich [ZMUM]; 1♂, India: Uttarakhand, Timishera, 30.3112°N, 78.3418°E, 1040m a.s.l., river, yard, 3-5.v.2012, K. Tomkovich [ZMUM].

Distribution: China (Guizhou, Taiwan), India, Nepal; USA (Hawaiian Is.).

***Phoomyia srilankensis* Naglis and Brooks, 2013**

Material examined: 1♂, India: Orissa, Gop, 19.982°N, 86.016°E, 8-9.i.2014, K. Tomkovich [ZMUM].

Distribution: Sri Lanka. New species for India.

***Thinophilus indigenus* Becker, 1902**

Material examined: 5♂, 2♀, India: Goa, Konkolim, 15.1919°N, 73.9979°E, 26.ii.2009, K. Tomkovich [ZMUM]; 1♂, India: Meghalaya, Sohra (Cherrapunjee), plateau, 25.27°N, 91.82°E, 1320m a.s.l., 14-26.ii.2013,

K. Tomkovich [ZMUM]; 2♂, 1♀, India: Orissa, Gop, 19.982°N, 86.016°E, 8-9.i.2014, K. Tomkovich [ZMUM]; 1♂, India: Orissa, Puri, 19.819°N, 85.870°E, 11-14.i.2014, K. Tomkovich [ZMUM]; 2♂, India: Assam, Chapar, riv. Champpamati, 26.323°N, 90.461°E, 40m a.s.l., 1-3.i.2014, K. Tomkovich [ZMUM];

Distribution: *Afrotropical*: Congo-Kinshasa, Cape Verde Is., Ethiopia, Madagascar, Gambia, Angola, Nigeria, Yemen, Benin, Ghana, Tanzania, Namibia, South Africa, Swaziland; *Oriental*: India, Nepal, China, Malaysia, Philippines; *Palearctic*: Algeria, Egypt, Iran, Israel, Mongolia, Turkey.

Discussion

A total of 158 dolichopodids have been recorded from India by previous studies (Chakraborty *et al.*, 2015; Grichanov, 2014). The present paper adds two new for science species (*Campsicnemus capellarii* and *C. uttarakhandicus*) and two species new for the country (*Argyrochlamys impudicus* and *Phoomyia srilankensis*). As a result, the fauna of Indian long-legged flies has reached to 162 species, discovered mainly during the 20th century. This number is estimated to be roughly 15% of the total dolichopodid fauna of the country. For comparison, the fauna of neighbouring China contains about 1200 known species of Dolichopodidae (Yang *et al.*, 2011; and recent papers). Therefore, a discussion on the zoogeography of Indian dolichopodid fauna is premature at this time. With the new taxonomic and nomenclatural data in the present paper, there are now three known Oriental species of *Campsicnemus* (*C. capellarii* and *C. uttarakhandicus* from India and *C. yunnanensis* from China).

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***Melinda pusilla pusilla* (Villeneuve, 1927) (Diptera: Calliphoridae), a new record from India with a revised key to the known Indian species**

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Abstract

Melinda pusilla pusilla (Villeneuve) is recorded for the first time from India. The specimen of this species was collected from Periyar, Kerala falling in the biodiversity rich region of Western Ghats. A key to adults of seven species recorded so far of this genus from India is provided.

Keywords: *Melinda pusilla pusilla*, Calliphoridae, Diptera, new record, India.

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Introduction

Paradichosia Senior-White and *Paurothrix* Bezzi were synonymized with genus *Melinda* Robineau-Desvoidy by Kurahashi (1970) in his revisionary work on Australian and Oriental Calliphorini. Verves (2005) placed 19 species under genus *Melinda* (Malloch) but treated four species namely *M. crinitarsis*, *M. nigricans*, *M. scutellata* and *M. vanemdeni* under genus *Paradichosia* Senior-White but for the present study, the status assigned by Kurahashi (1970) will be followed. Thus, the genus in question is currently represented by 25 species from the oriental region. *Melinda* (Malloch) was earlier represented by three species from India namely, *M. pusilla indica*, *M. abdominalis* and *M. scutellata*. Later, Nandi (1994) described a new species *M. bengalensis* from West Bengal, Singh and Sidhu (2007) added two new species, *M. chambenensis* and *M. chandigarhensis* from the states of Himachal Pradesh and Punjab (Bharti, 2011) and Bharti (2015) recorded *Melinda flavibasis* from Western Ghats. Presently, *Melinda pusilla* has been recorded from the regions of Western Ghats, bringing the total number of representatives to eight.

The species of this genus were recorded as parasites of land snails (Kano and Shinonaga, 1968). With long, shovel shaped ovipositor; species of genus *Melinda* are well adapted to viviparous habits which provides an edge over its closely allied and ancestral genus

Calliphora. The material was examined under Nikon SMZ 1500 (Nikon Instruments Inc., Japan) stereo zoom microscope. Digital images of *Melinda pusilla pusilla* were captured with the help of an MP evolution digital camera mounted on Nikon SMZ 1500 using Auto-Montage (Syncroscopy, Division of Synoptics, Ltd, UK) software. The images were processed and cleaned with Adobe Photoshop CS5 (Adobe Systems Software Ireland Ltd.). A revised key to the known Indian species of this genus is provided herewith.

***Melinda pusilla pusilla* (Villeneuve, 1927)
(Fig: 1-3)**

urn:lsid:zoobank.org:act:AB276EE4-8430-4E38-81D8-4B14EE8B7B44

Gymnadichosia pusilla Vill., 1927. *Rev. Zool. Afr.* 15:388.-Villeneuve, 1933, *Bull. Ann. Soc. Ent. Belg.* 73: 196.-Henning, 1941, *Ent. Beih. Berl.-Dahlem* 8:180.

Paradichosia pusilla: Sen.-White *et al.*, 1940, *Fauna Brit. India*, Dipt. 6: 64.- Zumpt, 1956, *Lind., Fliegen Pal. Reg.* 64i: 57. -Kano and Shinonaga, 1968, *Fauna Jap.*, Calliphoridae: 45.

Material examined: 1♂, India, Kerala, Periyar, 11.21N/77.44E, 1061m, 28.10.14; 1♂, India, Kerala, Periyar, 11.21N/77.44E, 1061m, 2.12.14.



Fig.1. *Melinda pusilla pusilla* (Villeneuve, 1927): Head



Fig. 2. *Melinda pusilla pusilla* (Villeneuve, 1927): Dorsal view



Fig. 3. *Melinda pusilla pusilla* (Villeneuve, 1927): Profile view

Distribution: India, Taiwan, South China, Burma and Japan.

Remarks: Kurahashi (1970) recognised three subspecies of *Melinda pusilla* Villeneuve namely, *Melinda pusilla pusilla* (Villeneuve), *Melinda pusilla indica* Kurahashi and *Melinda pusilla tribulis* (Villeneuve). Of the three subspecies only *Melinda pusilla indica* was reported to be present in India. *Melinda pusilla pusilla* new record from India differs from the earlier recorded species i.e. *M. pusilla indica* by the absence of hairs on the eyes, presence of presutural intra-alar and black hairs on sternopleura. The author was not able to separate two Indian species of genus *Melinda*, namely *M. bengalensis* Nandi and *M. chambaensis* Singh and Sidhu in the key to Indian species of genus *Melinda* provided in the paper due to lack of suitable morphological characters which could clearly distinguish these two species. Furthermore, an effort was made to procure the type material of the above listed species but the curators of the depositories mentioned in the paper could not verify the existence of type material in the depositories. Henceforth, the species were keyed out together in the present paper.

Bionomics: The species was collected from the outskirts of Periyar city, Kerala falling in the biodiversity rich regions of Western Ghats. The place is notable for its wildlife sanctuary and has been marked as protected area category II by IUCN. The temperature varies, depending upon the altitude (highest 1700m) and it ranges between 15°C in December and January and 31°C in April and May. Annual precipitation is between 2000 and 3000 mm. The flora mainly consists of tropical evergreen and moist deciduous forests, grasslands, stands of eucalyptus, hundreds of flowering plant taxa, including about 171 species of grass and 140 species of orchids. The area is surrounded by plantations of crops such as tea, cardamom, and coffee. The area is a famous tiger reserve and elephant reserve and is also known for more than 160 butterfly taxa, including the lime butterfly, Malabar tree nymph, and Travancore evening brown, and many kinds of moths, such as the Atlas moth.

Key to the species of genus *Melinda*

1. Eyes bare2
- Eyes hairy3
2. Legs black; pre-sutural intra-alar absent, epaulet and basicosta black; facial carina very strong.....***M. bengalensis* Nandi, *M. chambaensis* Singh & Sidhu** (Not sufficient morphological characters to separate the two species)
- Legs entirely yellow; pre-sutural intra-alar present, epaulet and basicosta yellow; facial carina weak***M. pusilla pusilla* (Villeneuve)**
3. Scutellum entirely black4
- Scutellum with at least apex yellowish 5
4. Facial carina absent; thorax and abdomen dark, blackish-grey, thorax showing traces of three dark stripes anteriorly; femora and tibia entirely fulvous yellow, tarsi black; wings quite conspicuously yellowish at the base; dc: 2+3.....***M. flavibasis* (Malloch)**
- Facial carina present; thorax shining black with purplish tinge and dark longitudinal stripes, tergites two and three light brown, black in the middle and tergites 4 and 5 dark brown; legs brownish; wings hyaline; dc: 3+4***M. chandigarhensis* Singh & Sidhu**
5. Front coxa yellow in front, femora fulvous yellow entirely; none of the hind tibial bristles exceptionally long or slender in both the sexes6
- Front coxa fuscous in front, femora fulvous yellow or dark brown entirely; one or two of the hind tibial bristles in male, 2-3X as long as tibial diameter, sternopleura covered with black hairs, abdomen in both sexes black except for narrow reddish margin.....***M. scutellata* (Senior-White)**
6. Scutellum entirely semi-pellucid yellow; sternopleura covered with black fine hairs, mesothoracic spiracle dark brown.....***M. abdominalis* (Malloch)**
- Scutellum with only the apex or apical margin yellow, black at base; sternopleura at least in part covered with yellow or brown soft hairs; mesothoracic spiracle pale yellow.....***M. pusilla indica* Kurahashi**

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The Empidoidea (Diptera) of the Utrish Nature Reserve, Russia

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Abstract

The first data on *Empidoidea* (Diptera) from the Utrish State Nature Reserve (Russia: Krasnodar Territory) resulting from the numerous short visits and analysis of 7 Malaise trap samples during 2013-2015 are presented. Seventy one species are collected from the following families: Atelestidae – 1, Empididae – 26, Hybotidae – 14, Microphoridae – 1, Dolichopodidae – 29. *Rhamphomyia maculipennis* Zetterstedt, 1842 (Empididae) is recorded from the Caucasus and Russia for the first time. Photographs of some species habitats are provided.

Key words: *Empidoidea, fauna, ecology, Utrish Nature Reserve, Caucasus, Russia.*

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Introduction

The superfamily Empidoidea is the largest group among Diptera, comprising some 11,500 described species in five distinct families: Atelestidae, Empididae, Hybotidae, Brachystomatidae and Dolichopodidae *sensu lato* (Sinclair and Cumming, 2006). Recently, Grichanov (2011) proposed the epifamily rank Dolichopodoidae, which is equivalent to Sinclair & Cumming's (2006) Dolichopodidae *sensu lato* and includes Dolichopodidae *sensu stricto*, Microphoridae and Parathalassiinae *incertae sedis*. Currently, the Caucasian Empidoidea comprise 16 genera and 169 species of Empididae; 81 species from 18 genera of Hybotidae; 1 genus and 1 species of Atelestidae; 2 genera and 2 species of Brachystomatidae (Kustov, 2014) and about 300 species belonging to some 50 genera of Dolichopodidae (Grichanov, 2007).

The Utrish State Nature Reserve has been established in 2010, being located in the Krasnodar Territory (the North-West Caucasus), at the northern Black Sea coast near the Anapa Resort; its total area is more than 10000 ha (fig. 1). The warm-temperate climate dominates on the territory, being characterized by hot dry summers and mild winters with no permanent snow cover. A distinctive feature of its flora is the unique

Mediterranean tertiary relict element. It is represented by many rare plant species. The most ancient plant association is Pistachio-Juniper woodlands, where the Mediterranean flora reaches 62% among the plants. The vegetation has been partly suffered from economic activity. The following water sources are located in the Utrish Reserve: the Sukhoi Liman Lake, a creek in the Vodopadnaya Schel (crevice), the Sukko river and two unnamed coastal lakes, as well as some temporary streams (State Nature Reserve Utrish, 2014).

The Empidoidea fauna of the Utrish Nature Reserve is poorly known, with only 16 species reported previously (Kustov, 2015), whereas the data on Dolichopodidae is absent. The annotated species composition of Empidoidea is given for the Reserve in the present paper for the first time and includes one species of Atelestidae, 26 of Empididae, 14 of Hybotidae, 1 of Microphoridae, and 29 species of Dolichopodidae, in all 71 species.

The global distribution of Empidoidea is here provided after the Fauna Europaea (Chvála, 2013) for empidoids and after Grichanov (2014) for Dolichopodidae. The local distribution of endemic and recently described species of empidoids in the Caucasus is given after Kustov and Shamshev

(2011, 2014); Kustov *et al.* (2014, 2015); Kustov and Zhrebilo (2015); Shamshev and Kustov (2006, 2008); Shamshev *et al.* (2015).

The material listed in this paper has been collected during 2013–2015 in different types of landscapes (figs 2-9). The authors of habitat photos and collectors of all specimens are S.Yu. Kustov and A.A. Getman; their names are omitted in the list of material. A hand net and seven Malaise traps placed throughout the Reserve have been used for the collection. Specimens examined in this study are deposited in the author's collections. The country lists are provided at the species distribution section for the Euroasian and African parts of the world. The species distribution in the Caucasian territory is discussed separately.

Family Atelestidae

Atelestus pulicarius (Fallén, 1816)

Material: 4♂, top of Schel Bazovaya, 427m, 44°45'11"N, 37°26'33"E, 25.iii.2013.

Distribution: Europe: Belgium, Croatia, Czech Republic, Danish mainland, Finland, Germany, Ireland, Slovakia, Slovenia, Sweden, Switzerland, UK, Russia (Central territory). Caucasus: Russia (Krasnodar Territory: Apsheronsk district). The uncommonly collected species is known from submontane and mountain forests of the North-West Caucasus and active from March to June.

Family Empididae

Empis (Leptempis) afipsiensis Shamshev et Kustov, 2007

Material: 5♂, 1♀, tract Dolgaya Niva, 17.iv.2014; 18♂, 6♀, same locality, 28.iv.2014; 1♂, same locality, 15.v.2014; 1♂, lake Sukhoi Liman, 17-18.iv.2014; 1♂, 1♀, Schel Mokraya, 18.iv.2014; 1♀, Raevskii Polygon, 28.iv.2014.

Distribution: Caucasus: Russia (Krasnodar Territory, Adygea), Georgia, Armenia. This endemic species is common in the Caucasus and known from submontane and mountain forests, being active during April-July.

Empis (Leptempis) confusa Loew, 1865

Material: 1♀, Schel Vodopadnaya, 29.iv.2014.

Distribution: Europe: Austria, Bulgaria, Czech Republic, European Turkey, French mainland, Greek mainland, Hungary, Italian mainland, Slovakia, Spanish mainland, Switzerland. Caucasus: Russia (Krasnodar Territory, Adygea). This uncommon species is known from lowland areas, submontane and mountain forests of the North-West Caucasus, and active during April-May.

Empis (Leptempis) grisea Fallén, 1816

Material: 2♂, 3♀, Schel Mokraya, 18.iv.2014; 1♀, Schel Vodopadnaya, 29.iv.2014.

Distribution: Europe: Austria, Bulgaria, Czech Republic, Danish mainland, Germany, Hungary, Ireland, Italian mainland, Poland, Romania, Slovakia, Sweden, Switzerland, the Netherlands, UK. Caucasus: Russia (Krasnodar Territory). *Empis grisea* is uncommonly collected species, known from submontane and mountain forests of the North-West Caucasus, and active during April-June.

Empis (Leptempis) nagalevskii Kustov et Shamshev, 2011

Material: 6♂, 9♀, tract Dolgaya Niva, 29.v.2014.

Distribution: Caucasus: Russia (Krasnodar Territory: Anapa and Severskaya districts), Abkhazia. This Caucasian endemic species is common, known from submontane forests of the North-West Caucasus, and active during April-June.

Empis (Leptempis) tatyanae Kustov et Shamshev, 2011

Material: 1♂, Raevskii Polygon, 28.iv.2014; 1♂, tract Dolgaya Niva, 15.v.2014.

Distribution: Caucasus: Russia (Krasnodar Territory), Azerbaijan. This Caucasian endemic species is uncommon, known from submontane and mountain forests of the Caucasus and active during May-June.

Empis (Xanthempis) alanica Shamshev, 1998

Material: 8♂, Schel Mokraya, 18.iv.2014; 2♂, same locality, 19.v.2014; 1♂, 1♀, tract Dolgaya Niva, 28.iv.2014; 6♂, 3♀, Schel Vodopadnaya, 29.iv.2014.

Distribution: Caucasus: Russia (North Ossetia, Krasnodar, Karachay-Cherkess and Stavropol Territories). The species occurs

from the foothills to the medium mountain belt of the North-West and Central Caucasus. *E. alanica* is endemic to the Caucasus and active during May-June.

***Empis (Xanthempis) grichanovi* Shamshev et Kustov, 2008**

Material: 1♂, lake Sukhoi Liman, 340m, 44°45'26"N, 37°27'36"E, 24-26.v.2013; 1♂, same locality, 15.v.2014; 5♂, 3♀, Beech forest, 428m, 44°45'56"N, 37°26'25"E, 25.v.2013; 1♂, top of Schel Bazovaya, 427m, 44°45'11"N, 37°26'33"E, 25.v.2013; 1♀, Schel Vodopadnaya, 223m, 44°45'46"N, 37°25'03"E, 26.v.2013; 11♂, 11♀, same locality, 30.v.2014.

Distribution: Caucasus: Russia (Krasnodar Territory), Georgia (Borjomi and Lagodekhi Nature Reserves). This common species is known from lowland areas and submontane and mountain forests of the Caucasus and active during May-June. *E. grichanovi* is endemic to the Caucasus.

***Empis (Xanthempis) pseudoconcolor* Shamshev et Kustov, 2008**

Material: 1♂, 1♀, Schel Vodopadnaya, 30.v.2014.

Distribution: Caucasus: Russia (Krasnodar and Stavropol Territories), Abkhazia. This endemic and uncommonly collected species is known from submontane and mountain forests of the Caucasus and active since May till July.

***Empis (Xanthempis) zamotailovi* Shamshev et Kustov, 2008**

Material: 3♂, Schel Vodopadnaya, 29.iv.2014; 2♂, 1♀, Schel Labanova, 29.iv.2015.

Distribution: Caucasus: Russia (Krasnodar Territory, Adygea). The very common in the Caucasus species is known from lowland areas, submontane and mountain forests and active during May-June. *E. zamotailovi* is endemic to the Caucasus.

***Empis (Empis) albopilosa* de Meijere, 1935**

Material: 11♂, 1♀, Schel Shirokaya, 44°43'N, 37°26'E, 27.iii.2014; 1♂, lake Sukhoi Liman, 17-18.iv.2014.

Distribution: Europe: Czech Republic, Germany, Switzerland, the Netherlands. Caucasus: Russia (Krasnodar Territory). This common species is known

from lowland areas and submontane forest of the North-West Caucasus, and active during March-May.

***Empis (Empis) daronicola* Çiftçi, 2012**

Material: 13♂, 4♀, Schel Mokraya, 18.iv.2014.

Distribution: Caucasus: Russia (Krasnodar Territory, Adygea, Karachay-Cherkessia), Georgia. Asia: Turkey. This common species is known from lowland to subalpine areas of the Caucasus and active during April-August.

***Empis (Empis) hirta* Loew, 1865**

Material: 1♂, lake Sukhoi Liman, 17-18.iv.2014; 2♂, Schel Mokraya, 18.iv.2014; 1♂, 1♀, tract Dolgaya Niva, 28.iv.2014; 1♂, 1♀, Schel Vodopadnaya, 29.iv.2014.

Distribution: Caucasus: Russia (Krasnodar Territory, Adygea), Georgia. This common species is known from lowland areas and submontane forest of the Caucasus and active during April-June.

***Empis (Empis) socrus* Syrovátka, 1983**

Material: 2♂, 1♀, tract Dolgaya Niva, 17.iv.2014; 15♀, same locality, 13♂, 1♀, lake Sukhoi Liman, 17-18.iv.2014; 1♂, 2♀, Schel Mokraya, 18.iv.2014; 2♂, Raevskii Polygon, 28.iv.2014; 19♂, 28.iv.2014; 2♂, Schel Vodopadnaya, 29.iv.2014.

Distribution: Caucasus: Russia (Krasnodar Territory, Adygea, Karachay-Cherkessia, Kabardino-Balkaria). *E. socrus* is very common from lowland areas, submontane and mountain forests of the Caucasus, being active since April till July.

***Empis (Empis) xanthopoda* Kustov et Shamshev, 2013**

Material: 3♂, 1♀, Schel Bazovaya, 240m, 44°44'27"N, 37°26'11"E, 25.v.2013; 1♂, same locality, spring, 54m, 44°43'47"N, 37°26'00"E, 26.v.2013; 2♂, 3♀, top of Schel Bazovaya, 427m, 44°45'11"N, 37°26'33"E, 25.v.2013; 17♂, 2♀, lake Sukhoi Liman, 340m, 44°45'26"N, 37°27'36"E, 24-26.v.2013; 13♂, 2♀, same locality, 15.v.2014; 5♂, 5♀, same locality, 29.v.2014; 3♂, 2♀, Schel Vodopadnaya, 223m, 44°45'46"N, 37°25'03"E, 26.v.2013; 43♂, 15♀, same locality, 30.v.2014; 5♂, 1♀, Schel Mokraya, 18.iv.2014; 4♂, Schel Shirokaya, 15.v.2014;

6♂, 11♀, tract Dolgaya Niva, 29.v.2014; 17♂, 17♀, Raevskii Polygon, 29.v.2014; 1♂, Schel Labanova, 19.v.2015.

Distribution: Caucasus: Russia (Krasnodar Territory, Adygea). This very common species is known from lowland areas and submontane forests of the North-West Caucasus, being active during April-May. *E. xanthopoda* is endemic to the Caucasus.

Empis (Euempis) calcarata Bezzi, 1899

Material: 7♂, Schel Bazovaya, 240m, 44°44'27"N, 37°26'11"E, 25.v.2013; 3♂, 1♀, same locality, spring, 54m, 44°43'47"N, 37°26'00"E, 26.v.2013; 1♂, 1♀, Schel Mokraya, 44°41'45"N, 37°30'59"E, 5.vi.2013; 2♂, Schel Shirokaya, 15.v.2014; 1♀, same locality, 29.v.2014; 8♂, 2♀, Raevskii Polygon, 29.v.2014; 1♂, lake Sukhoi Liman, 29.v.2014; 4♂, same locality, 17.vi.2014; 11♂, 8♀, Schel Vodopadnaya, 30.v.2014; 2♂, tract Dolgaya Niva, 17.vi.2014.

Distribution: Europe: Italian mainland. Caucasus: Russia (Krasnodar Territory: Anapa, Apsheronsk, Severskaya districts, Krasnodar city). Asia: Middle East. This is a very common species in lowland areas and submontane forests, especially in Mediterranean landscapes of the North-West Caucasus. *E. calcarata* is active during May-July.

Empis (Euempis) tessellata Fabricius, 1794

Material: 1♀, Schel Mokraya, 18.iv.2014; 1♀, tract Dolgaya Niva, 28.iv.2014.

Distribution: Europe: Austria, Belgium, Czech Republic, Danish mainland, French mainland, Germany, Hungary, Ireland, Lithuania, Norwegian mainland, Poland, Portugal, Slovakia, Slovenia, Sweden, Switzerland, the Netherlands, Ukraine, UK, Russia (central, northern, northwestern European territory). Caucasus: Russia (Krasnodar Territory, Adygea), Georgia (Kutaisi). Asia: Turkey, Russia (northern and southeastern Altay), Japan. Africa: North Africa. This widely distributed species is common from lowland areas to mountain forests of the Caucasus and active during April-July.

Empis (Pachymeria) femorata Fabricius, 1798

Material: 3♂, Raevskii Polygon, 17.iv.2014; 1♂, 1♀, same locality, 28.iv.2014; 1♀, Schel Mokraya, 18.iv.2014.

Distribution: Europe: Austria, Belgium, Czech Republic, French mainland, Germany, Hungary, Ireland, Italian mainland, Poland, Slovakia, the Netherlands, UK. Caucasus: Russia (Krasnodar Territory, Adygea). This species is uncommon, known from lowland areas and submontane forests of the North-West Caucasus and active since April till May.

Hilara brevistyla Collin, 1927

Material: 3♂, 3♀, tract Dolgaya Niva, 17.iv.2014; 1♂, 3♀, same locality, 28.iv.2014; 1♂, Schel Vodopadnaya, 223m, 44°45'46"N, 37°25'03"E, 18.vi.2014; 1♂, 1♀, Schel Labanova, 29.iv.2015.

Distribution: Europe: Austria, Czech Republic, Danish mainland, Finland, Germany, Hungary, Ireland, Poland, Slovakia, Slovenia, Sweden, Switzerland, the Netherlands, UK. Caucasus: Russia (Krasnodar Territory). This spring species is common, known from lowland areas and submontane forests of the North-West Caucasus and active in April.

Hilara cilipes Meigen, 1822

Material: 4♂, Schel Mokraya, 44°41'45"N, 37°30'59"E, 5.vi.2013.

Distribution: Europe: Austria, Czech Republic, French mainland, Germany, Hungary, Italian mainland, Poland, Slovakia, Romania, Switzerland, the Netherlands. Caucasus: Russia (Krasnodar Territory). This is uncommon species, known from submontane and mountain forests of the North-West Caucasus and active in June-July.

Hilara lurida (Fallén, 1816)

Material: 18♂, 12♀, lake Sukhoi Liman, 340m, 44°45'26"N, 37°27'36"E, 24-26.v.2013; 1♂, 2♀, top of Schel Bazovaya, 427m, 44°45'11"N, 37°26'33"E, 25.v.2013; 2♂, same locality, spring, 54m, 44°43'47"N, 37°26'00"E, 26.v.2013; 3♂, 1♀, Schel Vodopadnaya, 223m, 44°45'46"N, 37°25'03"E, 26.v.2013; 4♂, same locality, 223m, 44°45'46"N, 37°25'03"E, 26.v.2013; 27♂, 6♀, Schel Mokraya, 44°41'45"N, 37°30'59"E, 5.vi.2013.

Distribution: Europe: Albania, Austria, Czech Republic, Danish mainland,

Finland, French mainland, Germany, Hungary, Lithuania, Norwegian mainland, Poland, Romania, Slovakia, Sweden, Switzerland, the Netherlands, UK, Russia (northern, northwestern and southern European territories). Caucasus: Russia (Krasnodar Territory). *H. lurida* is very common in lowland areas and submontane forests of the North-West Caucasus and active during May-June.

***Hilara thoracica* Macquart, 1827**

Material: 4♂, lake Sukhoi Liman, 340m, 44°45'26"N, 37°27'36"E, 24-26.v.2013; 3♂, 1♀, Schel Vodopadnaya, 223m, 44°45'46"N, 37°25'03"E, 26.v.2013.

Distribution: Europe: Albania, Austria, Belgium, Czech Republic, Danish mainland, French mainland, Germany, Hungary, Ireland, Norwegian mainland, Poland, Slovakia, Spanish mainland, Sweden, Switzerland, the Netherlands, UK, Russia (northern, northwestern and southern European territories). Caucasus: Russia (Krasnodar Territory). This is a common species occurring from lowland areas to mountain forests of the North-West Caucasus and being active during May-July.

***Kowarzia barbatula* (Mik, 1880)**

Material: 1♂, 2♀, Schel Vodopadnaya, 29.iv.2014; 1♀, tract Dolgaya Niva, 17.vi.2014.

Distribution: Europe: Albania, Austria, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, French mainland, Germany, Greek mainland, Hungary, Italian mainland, Slovenia, Slovakia, Spanish mainland, Switzerland. Caucasus: Russia (Krasnodar Territory: Anapa and Apsheronsk districts), Abkhazia. This rarely collected species is known from foothill and mountain river banks of the North-West Caucasus and active since April till September.

***Rhamphomyia* (s. str.) *caucasica* Frey, 1953**

Material: 17♂, Raevskii Polygon, 17.iv.2014; 23♂, same locality, 28.iv.2014; 3♀, tract Dolgaya Niva, 17.vi.2014; 6♂, lake Sukhoi Liman, 340m, 44°45'26"N, 37°27'36"E, 17-18.iv.2014.

Distribution: Caucasus: Russia (Krasnodar Territory, Dagestan). *R. caucasica* is a commonly collected species, being known from lowland areas and submontane forests of

the North-West Caucasus and active in April and May.

***Rhamphomyia* (s. str.) *sulcatella* Collin, 1926**

Material: 1♂, lake Sukhoi Liman, 340m, 44°45'26"N, 37°27'36"E, 17-18.iv.2014.

Distribution: Austria, Czech Republic, French mainland, Germany, Hungary, the Netherlands, Slovakia, Switzerland, UK. Caucasus: Russia (Krasnodar Territory). This spring species is commonly collected from lowland areas and submontane forests of the North-West Caucasus, being active in April.

***Rhamphomyia* (*Megacyttarus*) *maculipennis* Zetterstedt, 1842**

Material: 1♂, lake Sukhoi Liman, 340m, 44°45'26"N, 37°27'36"E, 17-18.iv.2014.

Distribution: Europe: Croatia, Czech Republic, Denmark, Finland, Germany, Hungary, Ireland, the Netherlands, Norway, Slovakia, Sweden, Switzerland, UK. Caucasus: Russia (Krasnodar Territory). Asia: Turkey. *R. maculipennis* is an uncommonly collected species, being known from lowland areas and submontane forests of the North-West Caucasus and active in April.

Remarks: The species is recorded from the Caucasus and Russia for the first time.

***Rhamphomyia* (*Megacyttarus*) *tuberifemur* Barták, 2004**

Material: 13♂, 14♀, Schel Mokraya, 18.iv.2014; 1♀, tract Dolgaya Niva, 28.iv.2014; 9♂, Schel Vodopadnaya, 29.iv.2014.

Distribution: Caucasus: Russia (Krasnodar Territory), Georgia. *R. tuberifemur* is a commonly collected species, being known from lowland areas to mountain forests of the North-West Caucasus and active in April and June. This species is endemic to the Caucasus.

Family Hybotidae

***Hybos vagans* Loew, 1874**

Material: 3♂, 4♀, lake Sukhoi Liman, 340m, 44°45'26"N, 37°27'36"E, 24-26.v.2013; 1♀, same locality, 340m, 44°45'26"N, 37°27'36"E, 24-26.v.2013; 1♂,

same locality, Beech forest, 428m, 44°45'56"N, 37°26'25"E, 25.v.2013; 2♂, 6♀, Schel Bazovaya, 240m, 44°44'27"N, 37°26'11"E, 25.v.2013; 2♂, 1♀, top of Schel Bazovaya, 427m, 44°45'11"N, 37°26'33"E, 25.v.2013; 1♂, Schel Vodopadnaya, 223m, 44°45'46"N, 37°25'03"E, 26.v.2013; 6♂, 11♀, Schel Mokraya, 44°41'45"N, 37°30'59"E, 5.vi.2013; 3♂, tract Dolgaya Niva, 15.v.2014; 3♂, same locality, 29.v.2014.

Distribution: Asia: Iran, Turkey. Caucasus: Russia (Krasnodar Territory, Adygea, Karachay-Cherkessia, Chechnya), Abkhazia, Armenia, Azerbaijan, Georgia. *H. vagans* is a common species from lowland areas to mountain forests of the Caucasus and adjacent territories, being active during May-July.

***Leptopeza flavipes* (Meigen, 1820)**

Material: 2♂, 2♀, top of Schel Bazovaya, 427m, 44°45'11"N, 37°26'33"E, 25.v.2013; 6♀, Schel Bazovaya, 240m, 44°44'27"N, 37°26'11"E, 25.v.2013; 1♀, lake Sukhoi Liman, 340m, 44°45'26"N, 37°27'36"E, 24-26.v.2013; 1♀, same locality, Beech forest, 428m, 44°45'56"N, 37°26'25"E, 25.v.2013.

Distribution: Europe: Austria, Belgium, Croatia, Czech Republic, Danish mainland, Finland, French mainland, Germany, Hungary, Ireland, Italian mainland, Poland, Slovakia, Sweden, Switzerland, former Yugoslavia, UK, Russia (all European territory). Asia: Russia (East Siberia, Primorskii Territory). Nearctic. Caucasus: Russia (Krasnodar Territory). This common species known from submontane and mountain forests of the North-West Caucasus is active in May-July.

***Oropezella sphenoptera* (Loew, 1873)**

Material: 4♀, lake Sukhoi Liman, 340m, 44°45'26"N, 37°27'36"E, 24-26.v.2013; 1♀, top of Schel Bazovaya, 427m, 44°45'11"N, 37°26'33"E, 25.v.2013.

Distribution: Europe: Austria, Belgium, Czech Republic, Croatia, Danish mainland, Germany, Greek mainland, Hungary, Ireland, Italian mainland, Lithuania, Poland, Slovakia, Spanish mainland, Sweden, Switzerland, the Netherlands, UK, Russia (central and southern European territories). North Africa: Algeria. Caucasus: Russia (Krasnodar Territory). This common species

known from submontane and mountain forests of the North-West Caucasus is active in May-July.

***Platypalpus baldensis* (Strobl, 1899)**

Material: 17♂, 13♀, lake Sukhoi Liman, tract Dolgaya Niva, Raevskii Polygon, Schel Mokraya, Schel Vodopadnaya, 14-29.iv.2014.

Distribution: Europe: Austria, French mainland, Italian mainland, Switzerland. Caucasus: Russia (Krasnodar Territory: Goryachii Kluch and Severskaya districts). This is a common species of the plain territory and submontane forests of the North-West Caucasus and active in April-May.

***Platypalpus brachystylus* (Bezzi, 1892)**

Material: 5♂, 3♀, tract Dolgaya Niva, 17.iv.2014.

Distribution: Europe: Austria, Bulgaria, Czech Republic, Estonia, Germany, Hungary, Italian mainland, Slovakia, Sweden, Switzerland, Ukraine, Serbia, Russia (Southern European territory). Asia: Middle East. Caucasus: Russia (Kabardino-Balkaria: Azau). This is a common species occurring from the plain territories to subalpine landscapes of the Caucasus, being active in April-July.

***Platypalpus cothurnatus* Macquart, 1827**

Material: 1♂, 1♀, tract Dolgaya Niva, 13.vii.2014.

Distribution: Europe: Austria, Belgium, Belarus, Czech Republic, Danish mainland, Estonia, Finland, French mainland, Germany, Hungary, Ireland, Italian mainland, Norwegian mainland, Poland, Romania, Slovakia, Slovenia, Sweden, Switzerland, the Netherlands, Ukraine, UK, Russia (central European territory). Caucasus: Russia (Krasnodar Territory: Goryachii Kluch and Dinskoi districts). This common species is known from the submontane and mountain forests of the North-West Caucasus, being active since May till July.

***Platypalpus exilis* (Meigen, 1822)**

Material: 1♀, lake Sukhoi Liman, 17.iv.2014.

Distribution: Europe: Austria, Belgium, Croatia, Czech Republic, Danish mainland, Estonia, Finland, Germany, Hungary, Ireland, Norwegian mainland,

Poland, Romania, Slovakia, Sweden, Switzerland, the Netherlands, Ukraine, UK, Russia (northwestern, central and southern European territory). Caucasus: Russia (Krasnodar Territory), Georgia. This common species is known from the submontane and mountain forests of the North-West Caucasus, being active since April till June.

***Platypalpus infectus* (Collin, 1926)**

Material: 1♀, Tract Dolgaya Niva, 17.iv.2014; 2♀, same locality, 28.iv.2014.

Distribution: Europe: Austria, Belgium, Czech Republic, Danish mainland, Estonia, Finland, French mainland, Germany, Hungary, Latvia, Lithuania, Poland, Slovakia, Sweden, Switzerland, Ukraine, UK, Russia (northwestern and central European territory). Caucasus: Russia (Krasnodar Territory, Adygea). This common species is known from lowland areas, submontane and mountain forests of the Caucasus, being active during April-July.

***Platypalpus longiseta* (Zetterstedt, 1842)**

Material: 2♀, tract Dolgaya Niva, Schel Vodopadnaya, 28.iv-30.v.2014.

Distribution: Europe: Austria, Belgium, Corsica, Croatia, Czech Republic, Danish mainland, Estonia, Finland, French mainland, Germany, Hungary, Ireland, Italian mainland, Lithuania, Macedonia, Malta, Norwegian mainland, Poland, Spanish mainland, Slovakia, Sweden, Switzerland, the Netherlands, UK, Russia (northwestern and central European territory). Africa: North Africa. Caucasus: Russia (Krasnodar Territory: Goryachii Kluch district, Krimsk district), Georgia. *P. longiseta* is uncommon species, known from lowland areas and submontane forests and active in April.

***Platypalpus pallidiseta* Kovalev, 1978**

Material: 13♀, Schel Vodopadnaya, 2.vii.2014.

Distribution: Europe: Belgium, Germany, Romania, Slovakia, Switzerland, UK, Russia (northern, northwestern, central and southern European territory). Asia: Kazakhstan, Russia (East Siberia). Caucasus: Russia (Krasnodar Territory: Goryachii Kluch and Severskaya districts). This species is uncommon, known from lowland areas and submontane forests and active in July.

***Platypalpus pectoralis* (Fallén, 1815)**

Material: 2♂, Raevskii Polygon, 13.vi-17.ix.2014.

Distribution: Europe: Austria, Belgium, Bulgaria, Croatia, Czech Republic, Danish mainland, Estonia, Finland, French mainland, Germany, Hungary, Ireland, Italian mainland, Norwegian mainland, Poland, Slovakia, Sweden, Switzerland, the Netherlands, Ukraine, UK, Russia (northwestern, central and southern European territory). Caucasus: Russia (Krasnodar Territory), Georgia. This species is uncommon and known from submontane and mountain forests, being active during June-September.

***Platypalpus pseudosilvadissimus* Kustov, Shamshev & Grootaert, 2015**

Material: 2♀, tract Dolgaya Niva, 17.iv.2014.

Distribution: Russia (Krasnodar Territory, Karachay-Cherkessia). This uncommonly collected spring species is known only from submontane and mountain forests, being active in April-May.

***Tachydromia arrogans* (Linnaeus, 1761)**

Material: 1♂, Schel Vodopadnaya, 223m, 44°45'46"N, 37°25'03"E, 26.v.2013.

Distribution: Europe: Austria, Belgium, Czech Republic, Danish mainland, Estonia, Finland, French mainland, Germany, Greek mainland, Hungary, Norwegian mainland, Poland, Slovakia, Spanish mainland, Sweden, Switzerland, the Netherlands, Ukraine, UK, Russia (northwestern and central European territory). Asia: Syria. Africa: Tunisia. Caucasus: Russia (Krasnodar Territory, Adygea), Azerbaijan, Georgia. *T. arrogans* is a common species in the Caucasus, occurring from submontane to alpine landscapes, being active during May-July.

***Trichina elongata* Haliday, 1833**

Material: 1♂, 1♀, top of Schel Bazovaya, 427m, 44°45'11"N, 37°26'33"E, 25.v.2013; 1♀, lake Sukhoi Liman, 340m, 44°45'26"N, 37°27'36"E, 24-26.v.2013.

Distribution: Europe: Austria, Belgium, Czech Republic, Danish mainland, Finland, French mainland, Germany, Ireland, Norwegian mainland, Poland, Romania, Slovakia, Sweden, Switzerland, the

Netherlands, UK, Russia (all European territory). Caucasus: Russia (Krasnodar Territory: Apsheronsk district, Kabardino-Balkaria: Azau, Karachay-Cherkessia: Teberda). This species is common; known from submontane and mountain forests, being active during May-July.

Family Dolichopodidae *sensu lato*

Subfamily Microphorinae *sensu* Sinclair & Cumming (2006), or family Microphoridae *sensu* Grichanov (2011)

***Microphor holosericeus* (Meigen, 1804)**

Material: 5♀, lake Sukhoi Liman, 340m, 44°45'26"N, 37°27'36"E, 17-18.iv.2014; 1♀, tract Dolgaya Niva, 28.iv.2014; 1♂, 1♀, Schel Labanova, 29.v.2015.

Distribution: Europe: Austria, Bulgaria, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Lithuania, Macedonia, the Netherlands, Norway, Poland, Romania, Slovakia, Spain, Sweden, Switzerland, UK, Ukraine, Russia: (European Territory). Asia: Turkey. Caucasus: Russia (Krasnodar Territory). The species is common in the Caucasus.

Family Dolichopodidae *sensu stricto*

***Argyra leucocephala* (Meigen, 1824)**

Material: 2♂, 1♀, lake Sukhoi Liman, 340m, 44°45'26"N, 37°27'36"E, 24-26.v.2013; 1♂, 1♀, tract Dolgaya Niva, 17.ix.201; 1♀, same locality, 28.viii.2014.

Distribution: Europe: Andorra, Austria, Belarus, Belgium, Bulgaria, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Moldova, the Netherlands, Norway, Poland, Romania, Russia (all European territory), Slovakia, Sweden, Switzerland, UK, Ukraine (Chernovtsy, Kharkiv). Asia: Azerbaijan, Iran, Israel, Turkey (Adiyaman, Antalya). Africa: Algeria, Tunisia. Caucasus: Russia (Krasnodar Territory, Adygea). This species is common in the Caucasus.

***Dolichopus cilifemoratus* Macquart, 1827**

Material: 2♂, lake Sukhoi Liman, 3.vii.2014 [ethyl alcohol]; 1♀, same locality, 44°45'N, 37°27'E, 14.viii.2014 [ethyl alcohol]; 2♂, 2♀, same locality, 340m, 44°45'26"N, 37°27'36"E, 24-26.v.2013; 1♂, same locality,

29.v.2014; 1♀, Schel Vodopadnaya, 2.vii.2014.

Distribution: Europe: Austria, Belarus, Belgium, Bulgaria, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Italy, Norway, Poland, Romania, Slovakia, Sweden, UK, Russia: Crimea. Asia: N Kazakhstan, Turkey (Muğla, Rize), Russia (Altai, Krasnoyarsk, Sakhalin, Vladivostok Territories). Caucasus: Russia (Adygea, Dagestan, Karachay-Cherkessia, Krasnodar Territory), Armenia, Georgia. The species is common in North-West Caucasus.

***Dolichopus claviger* Stannius, 1831**

Material: 1♂, 1♀, Schel Bazovaya, 240m, 44°44'27"N, 37°26'11"E, 25.v.2013.

Distribution: All Europe. Asia: Russia (Tomsk Region, Altai, Krasnoyarsk Territory). Caucasus: Russia (Adygea, Kabardino-Balkaria, Karachay-Cherkessia, Krasnodar Territory, North Ossetia). The species is common in North-West Caucasus.

***Dolichopus griseipennis* Stannius, 1831**

Material: 1♀, tract Dolgaya Niva, 17.ix.2014 [ethyl alcohol]; 1♂, same locality, 17.iv.2014; 1♀, same locality, 17.vi.2014; 1♀, Raevskii Polygon, 17.ix.2014.

Distribution: Europe: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece incl. Crete, Hungary, Ireland, Italy, Lithuania, Luxembourg, the Netherlands, Norway, Poland, Romania, Serbia, Slovakia, Spain incl. Balearic Is., Sweden, Switzerland, UK, Russia: (Moscow, "Siberia"). Asia: Iran, Israel, N Kazakhstan, Turkey (Sinop), "Middle Asia". Africa: Algeria, Egypt, Morocco, Tunisia. Caucasus: Russia (Adygea, Krasnodar Territory), Armenia, Azerbaijan, Georgia. The species is common in North-West Caucasus.

***Dolichopus latilimbatus* Macquart, 1827**

Material: 2♂, lake Sukhoi Liman, 24.iv.2014 [ethyl alcohol]; 1♂, same locality, 3.vii.2014 [ethyl alcohol]; 1♀, same locality, 29.v.2014 [ethyl alcohol].

Distribution: Europe: Austria, Azerbaijan, Belarus, Belgium, Bulgaria, Czech Republic, Denmark, Estonia, France, Germany, Hungary, Ireland, Italy, the Netherlands, Poland, Romania, Slovakia, Spain, Sweden, Switzerland, UK, Ukraine (Ternopil), Russia (Kursk, Moscow, Orel,

Pskov, Rostov, Ryazan, Voronezh Regions, “Ural”). Asia: Iran, Kazakhstan, Mongolia, Turkey (Kocaeli-İzmit), Uzbekistan, Russia (Yakutia). Caucasus: Russia (Karachay-Cherkessia, Krasnodar Territory), Abkhazia. The species is not rare in North-West Caucasus.

***Dolichopus nubilus* Meigen, 1824**

Material: 1♂, 1♀, Schel Labanova, 9.v.2015, 21.vii.2015; 1♀, lake Sukhoi Liman, 340m, 44°45'26"N, 37°27'36"E, 24-26.v.2013; 1♀, same locality, 3.vii.2014.

Distribution: Europe: Austria, Belgium, Bulgaria, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece incl. Crete, Hungary, Ireland, Italy, Latvia, the Netherlands, Norway, Poland, Romania, Slovakia, Spain, Sweden, Switzerland, UK, Ukraine (Kherson, Odessa), Russia (Kaliningrad, Kursk, Karelia, Leningrad, Rostov, Saratov, Voronezh Regions). Asia: Russia (“Altai”), China (Xinjiang), Iran, Kazakhstan, Kyrgyzstan, Tajikistan, Turkey (Kırklareli), Uzbekistan. Caucasus: Russia (Adygea, Krasnodar Territory), Armenia, Azerbaijan. The species is common in North-West Caucasus.

***Dolichopus signifer* Haliday, 1838**

Material: 1♂, tract Dolgaya Niva, 17.ix.2014 [ethyl alcohol].

Distribution: Europe: Austria, Belgium, Bulgaria, Croatia, Czech Republic, France, Germany, Greece, Hungary, Iran, Ireland, Italy, the Netherlands, Norway, Poland, Portugal (Azores), Romania, Slovakia, Spain, Sweden, Switzerland, UK, Ukraine (Odessa), Russia (Crimea, Rostov, Voronezh Regions). Asia: Afghanistan, Kazakhstan, Tajikistan, Turkey (Burdur), Turkmenistan, Uzbekistan. Africa: Morocco. Caucasus: Russia (Krasnodar Territory, Kabardino-Balkaria), Georgia. This species is common in the Caucasus.

***Dolichopus unguatus* (Linnaeus, 1758)**

Material: 1♀, Schel Bazovaya, 240m, 44°44'27"N, 37°26'11"E, 25.v.2013.

Distribution: Europe: Austria, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, the Netherlands, Norway, Poland, Romania;

Serbia Slovakia, Spain, Sweden, Switzerland, UK, Ukraine: Kharkiv, Kiev, Odessa, Ternopil, Carpathia; Russia (Karelia, Kursk, Leningrad, Lipetsk, Mordovia, Moscow, Novgorod, Orel, Orenburg, Perm, Pskov, Ryazan, Tatarstan, Vologda, Voronezh Regions). Asia: China (Xinjiang), Iran, Kazakhstan, Turkey (Rize), Russia Altai, Irkutsk, Khabarovsk, Khantia-Mansia, Krasnoyarsk Territories). Caucasus: Georgia, Russia (Adygea, Kabardino-Balkaria, Karachai-Cherkessia, Krasnodar, North Ossetia Territories). *D. unguatus* is very common across the Palaearctic Region. The species is common in North-West Caucasus but infrequent.

***Gymnopternus blankaartensis* Pollet, 1990**

Material: 1♀, Schel Vodopadnaya, 2.vii.2014.

Distribution: Europe: Belgium, Czech Republic, France, Germany, Hungary, the Netherlands, Sweden, Switzerland, UK, Russia (Crimea). Asia: Iran, Turkey (Adıyaman). Caucasus: Azerbaijan. The species is new for the Krasnodar Territory.

***Hercostomus chetifer* (Walker, 1849)**

Material: 13♂, 13♀, Schel Vodopadnaya, 26.v.2013, 30.v.2014, 18.vi.2014 and 2.vii.2014; 1♀, tract Dolgaya Niva, 17.ix.2014.

Distribution: Europe: Austria, Belgium, Bosnia and Herzegovina, Croatia, Czech Republic, Finland, France, Germany, Greece, Hungary, Italy, Luxembourg, the Netherlands, Norway, Poland, Romania, Slovakia, Spain, Sweden, Switzerland, UK, Ukraine, Russia (Moscow). Asia: India, Israel, Turkey (Antalya). Africa: Algeria. Nearctic region: Canada, USA. Caucasus: Russia (Adygea, Krasnodar Territory). The species is common in North-West Caucasus.

***Hercostomus longiventris* (Loew, 1857)**

Material: 1♂, Schel Vodopadnaya, 26.v.2013.

Distribution: Europe: Austria, Belgium, Croatia, Czech Republic, France, Germany, Greece, Hungary, Italy, the Netherlands, Poland, Romania, Switzerland. Asia: Iran, Israel, Morocco, Tajikistan, Turkey (Artvin, Muğla). Caucasus: Russia (Alania, Kabardino-Balkaria, Krasnodar Territory), Georgia. North-West Caucasus – foothills.

***Liancalus virens* (Scopoli, 1763)**

Material: 4♂, Schel Mokraya, 44°41'45"N, 37°30'59"E, 5.vi.2013; 1♂, tract Dolgaya Niva, 17.vi.2014; 1♀, same locality, 28.viii.2014; 1♀, Schel Vodopadnaya, 18.vi.2014.

Distribution: Europe: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Finland, France, Germany, Greece incl. Crete; Hungary, Ireland, Italy, Luxembourg, the Netherlands, Norway, Poland, Portugal incl. Madeira, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, UK, Russia: (Crimea, Leningrad Region). Asia: Israel, S. Kazakhstan, Kyrgyzstan, Tajikistan, Turkey (Hakkari, Mugla), Russia ("Siberia"). Caucasus: Russia (Krasnodar Territory), Abkhazia, Azerbaijan, Georgia. Africa: Algeria, Morocco, Tunisia. North-West Caucasus – mountains, foothills.

***Medetera muralis* Meigen, 1824**

Material: 1♂, lake Sukhoi Liman, 44°45'N, 37°27'E, 29.v.2014.

Distribution: Austria, Belarus, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Israel, the Netherlands, Norway, Poland, Romania, Slovakia, Sweden, Turkey (Antalya, Denizli), UK, former Yugoslavia, Russia (Moscow Region). Caucasus: Russia (Adygea, Kabardino-Balkaria, Krasnodar Territory, North Ossetia), Abkhazia, Azerbaijan.

***Medetera truncorum* Meigen, 1824**

Material: 1♀, Raevskii Polygon, 15.v.2014.

Distribution: Europe: Austria, Belgium, Czech Republic, Croatia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Luxembourg, the Netherlands, Norway, Poland, Portugal incl. Azores, Slovakia, Spain, Sweden, Switzerland, UK, Ukraine (Kharkiv), former Yugoslavia, Russia (Crimea). Asia: Israel, Turkey (Adiyaman, Gaziantep, Hatay, Isparta, Mersin, Muğla, Şanlıurfa), Russia (Yakutia). Africa: Algeria, Egypt. Nearctic region: British Columbia, Wyoming, Oregon. Caucasus: Azerbaijan, Russia (Krasnodar Territory). The species is rare in the Caucasus.

***Neurigona erichsoni* (Zetterstedt, 1843)**

Material: 1♀, Schel Bazovaya, 240m, 44°44'27"N, 37°26'11"E, 25.v.2013.

Distribution: Europe: Austria, Belgium, Czech, Denmark, Estonia, France, Germany, Hungary, the Netherlands, Norway, Poland, Romania, Russia (Mordovia, Moscow, Orel Territories), Sweden, Switzerland, UK, Ukraine (Cherkasy, Kharkiv), former Yugoslavia. Asia: Iran, Turkey (Bursa, Çanakkale). Caucasus: Russia (Adygea, Krasnodar Territory, North Ossetia). The species is infrequent in the Caucasus.

***Peloropecodes acuticornis* (Oldenberg, 1916)**

Material: 1♀, tract Dolgaya Niva, 17.vi.2014.

Distribution: Europe: France, Greece (Crete), Romania. Asia: Turkey (Kütahya). Caucasus: Russia (Krasnodar Territory – Black Sea coast from Arkhipo-Osipovka to Anapa).

Remarks: This species is included into the Red Data Book of Krasnodar Territory, being collected in Russia for the third time.

***Poecilobothrus principalis* (Loew, 1861)**

Material: 1♀, lake Sukhoi Liman, 3.vii.2014.

Distribution: Europe: Austria, Belgium, Bulgaria, Czech Republic, France, Germany, Hungary, Italy, the Netherlands, Poland, Romania, Spain, UK, Ukraine. Asia: Israel, Turkey (Kutahya). Caucasus: Russia (Adygea, Krasnodar Territory). The species is rare in the Caucasus.

***Poecilobothrus varicoloris* (Becker, 1917)**

Material: 1♂, Schel Vodopadnaya, 18.vi.2014; 1♂, tract Dolgaya Niva, 3.vii.2014; 1♂, Schel Labanova, 9.v.2015.

Distribution: Europe: Russia (Stavropol). Asia: Turkey (Artvin). Caucasus: Abkhazia, Armenia, Georgia, Russia (Adygea, Kabardino-Balkaria, Karachay-Cherkessia, Krasnodar Territory, North Ossetia).

Remarks: The species is common in the Caucasian mountains. The Utrish Reserve is the westernmost collection point.

***Rhaphium appendiculatum* Zetterstedt, 1849**

Material: 1♂, lake Sukhoi Liman, 340m, 44°45'26"N, 37°27'36"E, 24-26.v.2013; 1♂, top of Schel Bazovaya, 427 m, 44°45'14"N, 37°26'23"E, 25.v.2013.

Distribution: Europe: Austria, Bulgaria, Czech Republic, Denmark, Finland,

France, Germany, Greece, Hungary, Ireland, Italy, the Netherlands, Poland, Romania, Slovakia, Spain, Sweden, UK, Russia (Crimea, Leningrad, Moscow, Pskov Regions, Ural Territories). Asia: Afghanistan, Iran, Turkey (Adiyaman, Korucuk), "Middle Asia". Africa: Algeria, Morocco, St. Helena (?introduced). Caucasus: Abkhazia, Georgia, Russia: (Adygea, Krasnodar Territory, North Ossetia). The species is common in North-West Caucasus.

***Rhaphium caliginosum* Meigen, 1824**

Material: 1♂, lake Sukhoi Liman, 340m, 44°45'26"N, 37°27'36"E, 24-26.v.2013; 1♂, top of Schel Bazovaya, 427m, 44°45'14"N, 37°26'23"E, 25.v.2013.

Distribution: Europe: Austria, Belgium, Bulgaria, Croatia, Denmark, Estonia, Finland, France, Germany, Greece, Italy, Latvia, the Netherlands, Norway, Romania, Serbia, Sweden, Switzerland, UK, Ukraine (Kherson, Odessa), Russia (Kaliningrad, Kursk, Leningrad, Moscow, Murmansk, Orel, Pskov, Rostov, Stavropol, Voronezh Territories). Asia: Israel, Syria, Turkey (Burdur, İzmir), Russia (Krasnoyarsk). Africa: Algeria, Morocco. Caucasus: Armenia, Azerbaijan, Russia (Adygea, Kabardino-Balkaria, Karachay-Cherkessia, Krasnodar Territory). North-West Caucasus – everywhere.

***Sciapus polozhentsevi* Negrobov, 1977**

Material: 1♂, lake Sukhoi Liman, 17.vi.2014 [ethyl alcohol].

Distribution: Russia (Adygea, Krasnodar Territory).

Remarks: The species is a rare endemic of the Caucasian mountains. The Utrish Reserve is the westernmost collection point.

***Sybistroma binodicornis* (Stackelberg, 1941)**

Material: 2♂, lake Sukhoi Liman, 340m, 44°45'26"N, 37°27'36"E, 24-26.v.2013.

Distribution: Russia: Adygea, Kabardino-Balkaria, Lipetsk and Volgograd Regions. North-West Caucasus – foothills, infrequent.

Remarks: This species is new for the Krasnodar Territory.

***Syntormon denticulatus* (Zetterstedt, 1843)**

Material: 2♂, 1♀, tract Dolgaya Niva, 17.vi.2014, 28.viii.2014, 3.x.2014; 3♀, same locality, 17.ix.2014.

Distribution: Europe: Belorussia, Bulgaria, Estonia, Finland, France, Germany, Greece, Italy, Norway, Poland, Romania, Serbia, Sweden, UK, Ukraine, Russia (Karelia, Leningrad, Moscow, Murmansk, Stavropol' Territories). Asia: Afghanistan, Israel, Kyrgyzstan, Tajikistan, Turkey. Africa: "North Africa". Caucasus: Abkhazia, Armenia, Azerbaijan, Russia (Adygea, Kabardino-Balkaria, North Ossetia).

Remarks: This species is new for the Krasnodar Territory.

***Syntormon fuscipes* (von Roser, 1840)**

Material: 1♂, Schel Vodopadnaya, 26.v.2013.

Distribution: Europe: Andorra, Austria, Belgium, Bulgaria, Czech Republic, Denmark, France, Germany, Greece, Hungary, the Netherlands, Poland, Romania, Serbia, Slovakia, Spain, Sweden, UK, Ukraine (Carpathians). Asia: Turkey. Caucasus: Abkhazia, Russia (Krasnodar Territory). Africa: Burundi, Kenya. The species is rare in the North-West Caucasus.

***Syntormon pallipes* (Fabricius, 1794)**

Material: 1♂, Schel Mokraya, 18.iv.2014; 8♂, 3♀, tract Dolgaya Niva, 15.v.2014, 3.vii.2014, 28.viii.2014, 17.ix.2014; 1♂, 4♀, Schel Vodopadnaya, 30.v.2014, 18.vi.2014 and 2.vii.2014.

Distribution: Europe: Austria, Belgium, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece incl. Crete, Hungary, Iceland, Ireland, Italy, Latvia, the Netherlands, Norway, Poland, Portugal incl. Madeira, Azores, Romania, Serbia, Slovakia, Spain, Sweden, Switzerland, UK, Ukraine (Kherson, Odessa), Russia (Leningrad, Murmansk, Rostov, Voronezh Territories). Asia: Afghanistan, China, Iran, Iraq, Israel, Jordan, Kyrgyzstan, Tajikistan, Turkey, Yemen, Uzbekistan. Africa: Algeria, Egypt, Morocco, Tunisia, Madagascar, Tanzania, St. Helena (?introduced). Caucasus: Abkhazia, Armenia, Azerbaijan, Georgia, Russia (Adygea, Crimea, Kabardino-Balkaria, Karachay-Cherkessia, Krasnodar Territory, North Ossetia). The species is common in North-West Caucasus.



Fig. 1. Map of the North-East Mediterranean, with inset showing the Utrish State Nature Reserve borders.



Fig. 2. Habitat at the Black sea coast (27.iii.2014)



Fig. 3. Steppe landscape at the Raevskii Polygon area (28.iv.2014)



Fig. 4. Habitat at top of the Schel Bazovaya crevice (25.v.2013)



Fig. 5. A Malaise trap at the Dolgaya Niva tract (28.iv.2014)



Fig. 6. A Malaise trap in the pistachio-juniper forest (28.iv.2014)



Fig. 7. Habitat at top of the Schel Vodopadnaya crevice (29.iv.2014)

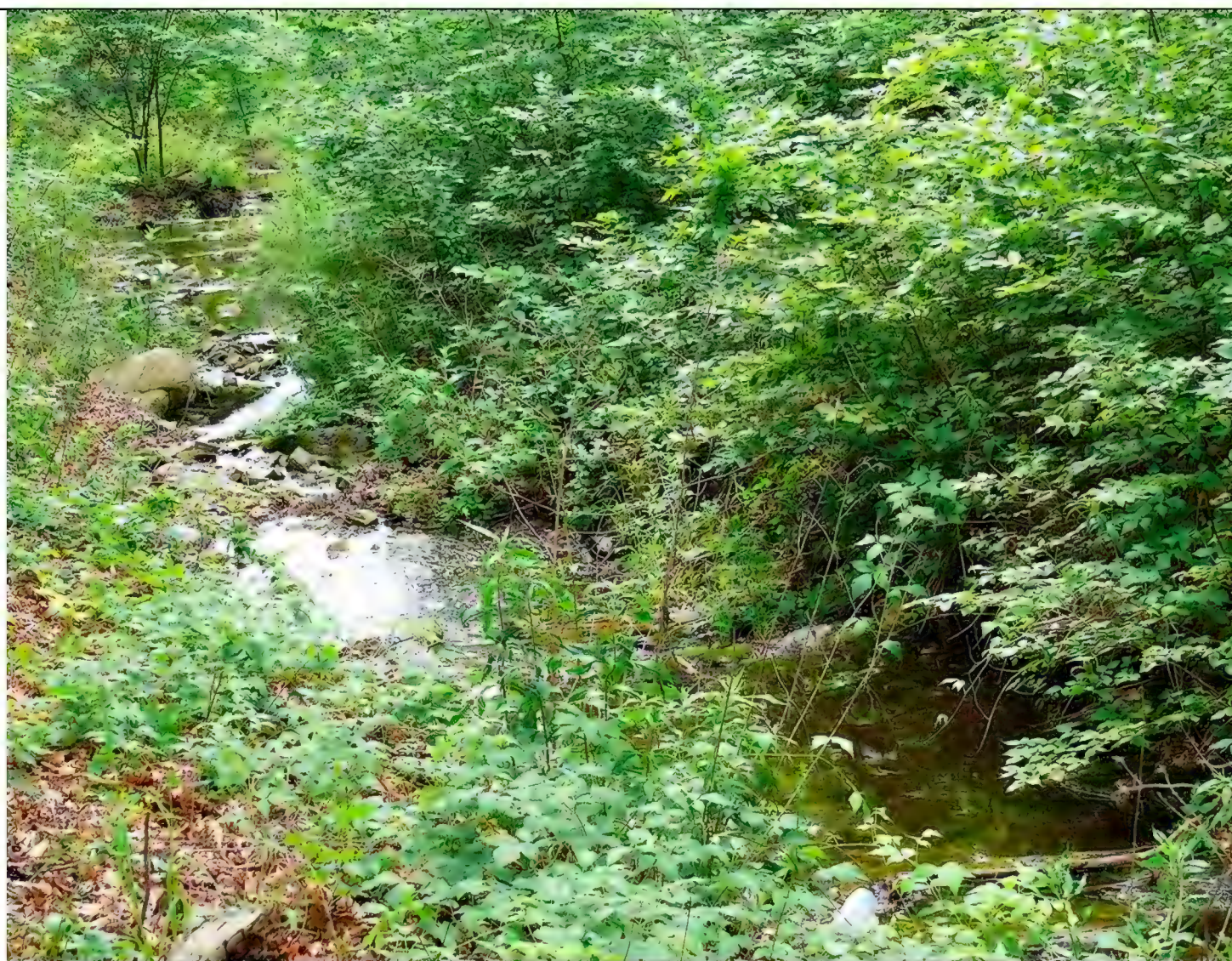


Fig. 8. Habitat at a stream in the Schel Mokraya crevice (5.vi.2013)



Fig. 9. Habitat at the Sukhoi Liman lake (26.v.2013)

***Syntormon pumilus* (Meigen, 1824)**

Material: 1♀, lake Sukhoi Liman, 3.vii.2014 [ethyl alcohol]; 1♀, same locality, 44°45'N, 37°27'E, 26.iii.2014.

Distribution: Europe: Austria, Belarus, Belgium, Bulgaria, Czech Republic, Denmark, Estonia, Finland, France, Germany, Great Britain, ?Greece, Hungary, Ireland, Italy, Latvia, Norway, Poland, Romania, Slovakia, ?Slovenia, Sweden, Spain (Canary Is.), UK, Ukraine (Kherson, Odessa), Russia (Kaluga, Karelia, Kursk, Leningrad, Lipetsk, Moscow, Murmansk, Pskov, Stavropol, Vologda, Voronezh Regions). Asia: Afghanistan, ?Israel, "Middle Asia", Russia (Astrakhan, Novosibirsk, Yakutia), Turkey. Caucasus: Armenia, Russia (Kabardino-Balkaria, Krasnodar Territory). Africa: ?Egypt, Morocco, Tunisia. The species is not rare in the North-West Caucasus.

***Systemus scholtzi* (Loew, 1850)**

Material: 1♀, lake Sukhoi Liman, 29.v.2014 [ethyl alcohol].

Distribution: Europe: Belgium, Denmark, Finland, France, Germany, Ireland, the Netherlands, Norway, Poland, Romania, Spain, Sweden, Slovakia, UK, Russia (Crimea). Asia: Tajikistan, Turkmenistan.

Caucasus: Russia (Krasnodar Territory). The species is rare in the North-West Caucasus.

***Teuchophorus monacanthus* Loew, 1859**

Material: 5♂, 3♀, tract Dolgaya Niva, 17.vi.2014, 14.viii.2014, 28.viii.2014, 17.ix.2014; 3♂, 5♀, Schel Vodopadnaya, 30.v.2014, 18.vi.2014 and 2.vii.2014.

Distribution: Europe: Austria, Belgium, Bulgaria, Czech Republic, Denmark, France, Germany, Greece incl. Crete, Hungary, Ireland, Italy, Latvia, Luxembourg, the Netherlands, Norway, Poland, Romania, Slovenia, Spain, Sweden, Switzerland, UK, Russia (Leningrad, Lipetsk, Murmansk, Stavropol, Voronezh Territories). Asia: Iraq, Israel, Turkey (Antalya, Artvin, Muğla), "Middle Asia". Caucasus: Russia (Adygea, Kabardino-Balkaria, Krasnodar Territory), Azerbaijan, Georgia. North-West Caucasus – everywhere.

***Xanthochlorus luridus* Negrobov, 1978**

Material: 1♂, Lake Sukhoi Liman, 340 m, 44°45'26"N, 37°27'36"E, 24-26.v.2013.

Distribution: Caucasus: Abkhazia, Russia (Adygea, Karachay-Cherkessia,

Krasnodar Territory, North Ossetia). North-West Caucasus – foothills.

Remarks: The species is an endemic of the Caucasian mountains. The Utrish Reserve is the westernmost collection point.

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Thrips (Insecta: Thysanoptera) of India- An Updated Checklist

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Abstract

An updated checklist of Thysanoptera from India is provided with their distribution data. In total 739 species in 259 genera are listed of which 309 species in 116 genera of suborder Terebrantia and 430 species in 143 genera of suborder Tubulifera. Forty four species with new distributional records are provided for different geographical regions of India.

Key Words: India, list, species, Thysanoptera

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Introduction

Insect order Thysanoptera with two suborders Terebrantia and Tubulifera, encompasses about 6102 species in eight families across the globe. The Terebrantia is known by about 2500 species, whereas the Tubulifera covers more than 3600 species from all over the world (ThripsWiki 2016).

Ramakrishna Ayyar, T. V. probably was the first to start taxonomy of these little insects in India. He along with Margabandhu V. has recorded 232 species of Thysanoptera from India in their catalogue which was published in 1940.

Ananthakrishnan & Sen (1980) listed 659 species of 253 genera of Thysanoptera in which 266 species of 110 genera of Terebrantia and 393 species of 143 genera. Later on, Bhatti (1990) catalogued 290 species of 124 genera of Terebrantia in 5 families from Indian subregion.

Further Sen (1980), Sen et al. (1988, 2000), Bhatti et al. (2006), Bhatti & Ranganath (2006), Bhatti (1997), Kumar et al. (2005a, 2005b, 2007), Kumar & Tyagi (2007), Tyagi et al. (2008), Tyagi & Kumar (2008a, 2008b) are some of the major studies which have substantially added a

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number of species to the Thysanoptera from India. These studies have substantially increased the number of species known from India, totaling 739 species in 259 genera belonging to six families. Out of which Terebrantia contains 309 species in 116 genera in five families: Aeolothripidae (17 species of 9 genera), Merothripidae (3 species of 2 genera), Melanthripidae (3 species of one genus), Stenurothripidae (2 species of one genus), Thripidae (284 species of 103 genera) and Tubulifera with 430 species of 143 genera in its sole family Phlaeothripidae. The objective of this paper is to provide up to date list on thrips fauna of India with distribution records.

The Checklist

Full synonymies for the names listed here are available on the web (ThripsWiki). Distribution records of species are based on Ananthakrishnan & Sen (1980), Bhatti (1990, 1997), recent publication of the authors. The symbol (*) indicates new distributional record from different geographical part of India for the species.

Family Aeolothripidae

Aduncothrips Ananthakrishnan 1964

Aduncothrips asiaticus (Ramakrishana and Margabandhu 1931). Distribution: India (Karnataka, Tamil Nadu).

Aeolothrips Haliday 1836

Aeolothrips collaris Priesner 1919. Distribution: India (Bihar, Delhi,

Himachal Pradesh, Punjab, Tripura, Uttar Pradesh, West Bengal).

Aeolothrips distinctus Bhatti 1971. Distribution: India (Himachal Pradesh, Uttar Pradesh).

Aeolothrips indicus Bhatti 1964. Distribution: India (Punjab).

Aeolothrips intermedius Bagnall 1934. Distribution: India (Punjab).

Aeolothrips mongolicus Pelikán 1985. Distribution: India (Delhi, Uttar Pradesh*).

Aeolothrips moundi Kulshrestha & Vijay Veer 1984. Distribution: India (Uttar Pradesh).

Aeolothrips nigricornis Ananthakrishnan 1968. Distribution: India (Tamil Nadu).

Allelothrips Bagnall 1932

Allelothrips pandyani (Ramakrishna and Margabandhu 1931). Distribution: India (Madhya Pradesh, Tamil Nadu).

Franklinothrips Back 1912

Franklinothrips megalops Trybom 1912. Distribution: India (West Bengal, Odisha*, Tamil Nadu).

Franklinothrips uttarakhandiensis Vijay Veer 2010. Distribution: India (Uttarakhand).

Franklinothrips vespiformis (Crawford, D.L. 1909). Distribution: India (Chhattisgarh, Karnataka, Maharashtra*, Tamil Nadu*).

Gelothrips Bhatti 1967

Gelothrips cinctus (Hood 1918). Distribution: India (Madhya Pradesh).

Indothrips Bhatti 1967

Indothrips bhushani Bhatti 1967. Distribution: India (Delhi, Karnataka,

Madhya Pradesh, Rajasthan, Uttar Pradesh).

Mymarothrips Bagnall 1928

Mymarothrips garuda Ramakrishna and Margabandhu 1931. Distribution: India (Madhya Pradesh, Tamil Nadu, West Bengal*).

Orothrips Moulton 1907

Orothrips yosemitii Moulton 1911. Distribution: India (Karnataka).

Streothrips Bhatti 1971

Streothrips arorai (Bhatti 1967). Distribution: India (Karnataka*, Madhya Pradesh).

Family Melanthripidae Bagnall

Melanthrips Haliday 1836

Melanthrips affluens Ananthakrishnan 1966. Distribution: India (Maharashtra).

Melanthrips baileyi Ananthakrishnan 1965. Distribution: India (Goa-Karnataka Broader).

Melanthrips indicus Bhatti 1967. Distribution: India (Madhya Pradesh).

Family Merothripidae Hood

Erotidothrips Priesner 1939

Erotidothrips mirabilis Priesner 1939. Distribution: India (Kerala).

Merothrips Hood 1912

Merothrips indicus Bhatti & Ananthakrishnan 1975. Distribution: India (Kerala, Tamil Nadu, West Bengal*).

Merothrips morgani Hood 1912. Distribution: India (Tamil Nadu).

Family Stenurothripidae

Holarthothrips Bagnall 1927

Holarthothrips indicus Bhatti & Ananthakrishnan 1978. Distribution: India (Delhi, Karnataka, Madhya Pradesh, Punjab).

Holarthothrips jambudvipae (Ramakrishna 1928). Distribution: India (Karnataka, Tamil Nadu).

Family Thripidae Stephens

Subfamily Dendrothripinae

Asprothrips J. C. Crawford 1938

Asprothrips indicus (Bagnall 1919). Distribution: India (Kerala).

Asprothrips navsariensis Tyagi 2011. Distribution: India (Gujarat).

Dendrothrips Uzel 1895

Dendrothrips albus Bhatti 1967. Distribution: India (Madhya Pradesh).

Dendrothrips aspersus Bhatti 1971. Distribution: India (Jammu & Kashmir).

Dendrothrips cameroni Priesner 1965. Distribution: India (Delhi).

Dendrothrips cibarius Ananthakrishnan 1965. Distribution: India (Maharashtra).

Dendrothrips elixae Bhatti 1971. Distribution: India (Maharashtra).

Dendrothrips faurei Bhatti 1971. Distribution: India (Maharashtra).

Dendrothrips jasminum (Ramakrishna and Margabandhu 1939). Distribution: India (Tamil Nadu).

Dendrothrips mendax Bhatti 1971. Distribution: India (Uttar Pradesh).

Dendrothrips minutus (Ananthakrishnan 1961). Distribution: India (Karnataka, Madhya Pradesh, Uttar Pradesh).

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Dendrothrips punctatus zur Strassen 1968.
Distribution: India (Delhi, Tamil Nadu).

Dendrothrips saltator Uzel 1895.
Distribution: India (Jammu & Kashmir).

Dendrothrips sexmaculatus Bagnall 1916.
Distribution: India (Karnataka, Kerala, West Bengal).

Dendrothrips stannardi (Ananthakrishnan 1958). Distribution: India (Tamil Nadu).

Dendrothrips strasseni Bhatti 1971.
Distribution: India (Maharashtra, Uttar Pradesh).

***Leucothrips* Reuter, 1904**

Leucothrips nigripennis Reuter, 1904.
Distribution: India (Tamil Nadu).

***Parsiiothrips* Bhatti 1970**

Parsiiothrips fuscus Bhatti 1970.
Distribution: India (Uttar Pradesh).

***Projectothripoides* Shumsher 1942**

Projectothripoides pandai (Shumsher 1942).
Distribution: India (Odisha).

***Pseudodendrothrips* Schmutz 1913**

Pseudodendrothrips albana Bhatti 1997.
Distribution: India (Delhi, Karnataka).

Pseudodendrothrips bhattii Kudo 1984.
Distribution: India (Karnataka, Tamil Nadu).

Pseudodendrothrips kulshresthai Chauhan & Vijay Veer, 1992. Distribution: India (Uttarakhand).

Pseudodendrothrips mori (Niwa 1908).
Distribution: (Karnataka).

Pseudodendrothrips ornatissimus Schmutz 1913. Distribution: India (Kerala, Tamil Nadu, West Bengal)

Pseudodendrothrips suvarna Bhatti 1997.
Distribution: India (Delhi, Maharashtra, Karnataka, Uttar Pradesh*).

Subfamily Panchaetothripinae

***Astrothrips* Karny 1921**

Astrothrips asiaticus (Bhatti 1967).
Distribution: India (Kerala, Madhya Pradesh, Maharashtra, Tamil Nadu, West Bengal).

Astrothrips globiceps (Karny 1913).
Distribution: India (Maharashtra).

Astrothrips lantana Bhatti 1967.
Distribution: India (Madhya Pradesh).

Astrothrips parvilimbus Stannard & Mitri 1962. Distribution: India (Andamans, Meghalaya, Tamil Nadu, West Bengal).

Astrothrips stannardi Bhatti 1967.
Distribution: India (Delhi, Haryana, Punjab*, Rajasthan, Uttar Pradesh*)

Astrothrips tumiceps Karny 1923.
Distribution: India (Delhi*, Karnataka*, Madhya Pradesh, Punjab*, Tamil Nadu, Uttar Pradesh*, West Bengal*).

***Caliothrips* Daniel 1904**

Caliothrips graminicola (Bagnall & Cameron 1932). Distribution: India (Delhi, Jammu & Kashmir, Tamil Nadu, West Bengal, widely distributed).

Caliothrips impurus (Priesner 1928).
Distribution: India (Madhya Pradesh, Tamil Nadu).

Caliothrips indicus (Bagnall 1913).
Distribution: India (Delhi*, south of Himalaya, Karnataka*, West Bengal, widely distributed).

Caliothrips luckmanni Wilson 1975.
Distribution: India (Delhi, Madhya Pradesh, Tamil Nadu, West Bengal*).

Caliothrips sudanensis (Bagnall & Cameron 1932). Distribution: India.

Euidothrips Ananthakrishnan 1968
Euidothrips apsarus Ananthakrishnan 1968.
Distribution: India (Andhra Pradesh).

Helionothrips Bagnall 1932
Helionothrips aino (Ishida 1931).
Distribution: India (Himachal Pradesh).
Helionothrips kadaliphilus (Ramakrishna and Margabandhu 1931). Distribution: India (Kerala, Maharashtra, Manipur, Meghalaya, Tamil Nadu, West Bengal).
Helionothrips nilgircus (Ananthakrishnan 1967). Distribution: India (Tamil Nadu).
Helionothrips parvus Bhatti 1968.
Distribution: India (Uttar Pradesh).
Helionothrips shivalik Bhatti 2006.
Distribution: India (Punjab).

Heliothrips Haliday 1836
Heliothrips haemorrhoidalis (Bouché 1833).
Distribution: India (Andamans, Karnataka, Kerala, Meghalaya, Tamil Nadu).

Hercinothrips Bagnall 1932
Hercinothrips bicinctus (Bagnall 1919).
Distribution: India (Tamil Nadu).

Monilothrips Moulton 1929
Monilothrips kempi Moulton 1929.
Distribution: India (Madhya Pradesh, Uttar Pradesh, Tamil Nadu, West Bengal).

Noathrips Bhatti 1967
Noathrips prakashi Bhatti 1967.
Distribution: India (Madhya Pradesh).

Panchaetothrips Bagnall 1912
Panchaetothrips noxius Priesner 1937.
Distribution: India (Uttarakhand).
Panchaetothrips indicus Bagnall 1912.
Distribution: India (Assam, Bihar, Goa, Haryana, Kerala, Manipur, Tamil Nadu, Uttar Pradesh, West Bengal).

Parthenothrips Uzel 1895
Parthenothrips dracaenae (Heeger 1854).
Distribution: India (Madhya Pradesh, Tamil Nadu).

Phibalothrips Hood 1918
Phibalothrips peringueyi (Faure 1925).
Distribution: India (Delhi, Karnataka, Madhya Pradesh, Manipur, Meghalaya, Tamil Nadu, Uttar Pradesh, West Bengal, widely distributed).

Retithrips Marchal 1910
Retithrips syriacus (Mayet 1890).
Distribution: India (Andaman Island, Goa, Karnataka*, Kerala, Tamil Nadu, West Bengal)

Rhipiphorothrips Morgan 1913
Rhipiphorothrips cruentatus Hood 1919.
Distribution: India (Andaman Island, Assam, Delhi, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Punjab, Tamil Nadu, Uttar Pradesh*, West Bengal).
Rhipiphorothrips pulchellus Morgan 1913.
Distribution: India (Madhya Pradesh, West Bengal*, Delhi*).

Selenothrips Karny 1911
Selenothrips rubrocinctus (Giard 1901).
Distribution: India (Andaman Island,

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Assam, Karnataka, Kerala, Manipur, Meghalaya, West Bengal).

Tryphactothrips Bagnall 1919

Tryphactothrips rutherfordi (Bagnall 1915).

Distribution: India (Tamil Nadu).

Zaniothrips Bhatti 1967

Zaniothrips ricini Bhatti 1967. Distribution:

India (Madhya Pradesh, West Bengal).

Subfamily Sericothripinae

Hydatothrips Karny 1913

Hydatothrips ananthakrishnani Bhatti 1973.

Distribution: India (Madhya Pradesh, Tamil Nadu).

Hydatothrips atactus Bhatti 1973.

Distribution: India (Delhi).

Hydatothrips aureus Bhatti 1973.

Distribution: India (Tamil Nadu).

Hydatothrips boerhaaviae Seshadri & Ananthakrishnan 1954. Distribution: India (Delhi, Jammu & Kashmir, Maharashtra, Tamil Nadu, Uttar Pradesh).

Hydatothrips dorax Bhatti 1973.

Distribution: India (Madhya Pradesh, Tamil Nadu).

Hydatothrips hartwigi (Bhatti 1973).

Distribution: India (Madhya Pradesh).

Hydatothrips proximus Bhatti 1973.

Distribution: India (Himachal Pradesh, Uttarakhand).

Hydatothrips ramaswamiahi Priesner 1926.

Distribution: India (Delhi, Haryana, Kerala, Madhya Pradesh, Rajasthan, Tamil Nadu).

Neohydatothrips John 1929

Neohydatothrips gracilipes (Hood 1924).

Distribution: India (Chandigarh, Delhi, Karnataka, Tamil Nadu).

Neohydatothrips latis (Bhatti 1973).

Distribution: India (Maharashtra).

Neohydatothrips plynopygus (Karny, 1925).

Distribution: India (Kerala).

Neohydatothrips raniae (Bhatti 1967).

Distribution: India (Delhi, Uttar Pradesh).

Neohydatothrips samayunkur Kudô 1995.

Distribution: India (Andaman Island, Delhi, Himachal Pradesh, Karnataka, Maharashtra, Manipur, Uttarakhand).

Subfamily Thripinae

Abacothrips Bhatti 1986

Abacothrips lotus Bhatti 1986. Distribution:

India (Jammu & Kashmir).

Agalmothrips Priesner 1965

Agalmothrips parviceps (Priesner 1965).

Distribution: India (Tamil Nadu).

Agriothrips Ananthakrishnan 1966

Agriothrips brevisetosus Ananthakrishnan

1966. Distribution: India (Kerala).

Ajothrips Bhatti 1967

Ajothrips gara Bhatti 1967. Distribution:

India (West Bengal).

Ajothrips karma Bhatti 1967. Distribution:

India (West Bengal).

Ajothrips medius Bhatti 1997. Distribution:

India (Delhi).

Akheta Bhatti 1978

Akheta indica Bhatti 1999. Distribution:

India (Kerala).

Alathrips Bhatti 1970

- Alathrips roonwali* (Bhatti 1963). Distribution: India (Andhra Pradesh, Delhi, Gujarat, Rajasthan).
- Amalothrips* Ananthakrishnan 1967
Amalothrips flaccidus Ananthakrishnan 1967. Distribution: India (Tamil Nadu).
- Amphithrips* Ananthakrishnan 1965
Amphithrips argutus Ananthakrishnan 1965. Distribution: India (Andhra Pradesh).
- Anaphothrips* Uzel 1895
Anaphothrips latis Bhatti 1967. Distribution: India (Maharashtra).
Anaphothrips obscurus (Müller 1776). Distribution: India (Himachal Pradesh, Jammu & Kashmir).
Anaphothrips sudanensis Trybom 1911. Distribution: India (Delhi, Karnataka, Meghalaya, Punjab, Sikkim, West Bengal, widely distributed).
- Anascirtothrips* Bhatti 1961
Anascirtothrips arorai Bhatti 1961. Distribution: India (Delhi, Madhya Pradesh, Maharashtra, Punjab, Tamil Nadu, West Bengal).
- Aneurothrips* Karny 1912
Aneurothrips priesneri Bhatti 1971. Distribution: India (Tamil Nadu).
- Aptinothrips* Haliday 1836
Aptinothrips rufus (Haliday 1836). Distribution: India (Himachal Pradesh, Jammu & Kashmir, Tamil Nadu, Uttar Pradesh, West Bengal).
- Aptinothrips styliifer* Trybom 1894. Distribution: India (Uttar Pradesh).
- Aroidothrips* Ananthakrishnan 1960
Aroidothrips longistylus Ananthakrishnan 1960. Distribution: India (Karnataka, Tamil Nadu, West Bengal).
- Arorathrips* Bhatti 1990
Arorathrips mexicanus (D. L. Crawford 1909). Distribution: India (Karnataka*, Kerala, Tamil Nadu).
- Ayyaria* Karny 1927
Ayyaria chaetophora Karny 1927. Distribution: India (Andhra Pradesh, Delhi, Haryana, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha*, Tamil Nadu, Uttar Pradesh, West Bengal).
- Bacathrips* Bhatti 1990
Bacathrips solanifolii (Shumsher 1944). Distribution: India (Tamil Nadu).
- Bathrips* Bhatti 1962
Bathrips jasminae Ananthakrishnan 1968. Distribution: India (Karnataka, Maharashtra, Tamil Nadu).
Bathrips melanicornis (Shumsher 1946). Distribution: India (Andhra Pradesh, Delhi, Karnataka, Madhya Pradesh, Punjab, Tamil Nadu, Uttar Pradesh*, West Bengal).
- Biltothrips* Bhatti 1973
Biltothrips minutus (Bhatti 1967). Distribution: India (Madhya Pradesh, Maharashtra, West Bengal).

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***Bolacothrips* Uzel 1895**

Bolacothrips bicolor Ananthakrishnan 1960.

Distribution: India (Tamil Nadu).

Bolacothrips evittatus (Sakimura 1958).

Distribution: India (Tamil Nadu).

Bolacothrips indicus (Ananthakrishnan 1966). Distribution: India (Gujarat, Kerala, Madhya Pradesh, Tamil Nadu, West Bengal*).

Bolacothrips striatopennatus (Schmütz 1913).

Distribution: India (Delhi, Karnataka*, Madhya Pradesh, Tamil Nadu, Uttar Pradesh, West Bengal).

***Bregmatothrips* Hood 1912**

Bregmatothrips binervis (Kobus 1893).

Distribution: India (Gujarat, Madhya Pradesh, Tamil Nadu).

Bregmatothrips brachycephalus (Shumsher 1942). Distribution: India (Delhi, Haryana, Madhya Pradesh, Rajasthan, Tamil Nadu).

***Capitothrips* Bhatti 1974**

Capitothrips subramanii Bhatti 1974.

Distribution: India (Tamil Nadu).

***Caprithrips* Faure 1933**

Caprithrips ajanta Bhatti 1980. Distribution: India (Maharashtra).

Caprithrips melanophthalmus (Bagnall 1927).

Distribution: India (Himachal Pradesh, Jammu & Kashmir).

Caprithrips orientalis Bhatti 1973.

Distribution: India (Madhya Pradesh, Tamil Nadu).

***Ceratothripoides* Bagnall 1918**

Ceratothripoides claratris (Shumsher 1946).

Distribution: India (Delhi, Maharashtra, Odisha, Tamil Nadu).

***Chaetanaphothrips* Priesner 1925**

Chaetanaphothrips leeuweni (Karny 1914).

Distribution: India (Tamil Nadu).

Chaetanaphothrips orchidii (Moulton 1907).

Distribution: India (Maharashtra, Tamil Nadu, West Bengal*).

***Chirothrips* Haliday 1836**

Chirothrips africanus Priesner 1932.

Distribution: India (Delhi, Maharashtra, Rajasthan, Tamil Nadu).

Chirothrips capensis zur Strassen 1958.

Distribution: India (Tamil Nadu).

Chirothrips maximi Ananthakrishnan 1957.

Distribution: India (Tamil Nadu).

Chirothrips meridionalis Bagnall 1927.

Distribution: India (Delhi, Punjab, Chandigarh, Delhi, Uttar Pradesh).

***Craspedothrips* zur Strassen 1966**

Craspedothrips minor (Bagnall 1921).

Distribution: India (Delhi, Karnataka, Madhya Pradesh, Punjab, Tamil Nadu, West Bengal).

***Ctenidothrips* Priesner 1952**

Ctenidothrips bambusae Priesner 1952.

Distribution: India (Tamil Nadu, West Bengal).

***Ctenothrips* Franklin 1907**

Ctenothrips barapatharensis Tyagi, Ghosh & Kumar (2014). Distribution: India (Himachal Pradesh).

Ctenothrips niger Kudo 1977. Distribution: India (Himachal Pradesh).

Ctenothrips smilax Bhatti 1976.

Distribution: India (Himachal Pradesh, Jammu & Kashmir).

***Danothrips* Bhatti 1971**

Danothrips setifer Bhatti 1971. Distribution: India (Kerala, Tamil Nadu).

***Dendrothripoides* Bagnall 1923**

Dendrothripoides innoxius (Karny 1914). Distribution: India: (Delhi, Karnataka).

***Diarthrothrips* Williams 1915**

Diarthrothrips nimbus (Ananthakrishnan 1965). Distribution: India (Andhra Pradesh, Delhi*, Karnataka*, Madhya Pradesh, Maharashtra, Rajasthan, Uttar Pradesh*, Tamil Nadu).

***Dichromothrips* Priesner 1932**

Dichromothrips corbetti (Priesner 1936). Distribution: India (Delhi).

Dichromothrips indicus Mound 1976. Distribution: India (Delhi, West Bengal).

Dichromothrips nakahari Mound 1976. Distribution: India (Meghalaya, West Bengal).

Dichromothrips phalaenopsidis Sakimura 1955. Distribution: India (Maharashtra).

Dichromothrips smithi (Zimmermann 1900). Distribution: India (Tamil Nadu).

***Eremiothrips* Priesner 1950**

Eremiothrips antilope (Priesner 1923). Distribution: India (Rajasthan).

Eremiothrips varius (Bhatti 1967). Distribution: India (Delhi*).

Eremiothrips acutus (Bhatti 1972). Distribution: India (Haryana).

***Ernothrips* Bhatti 1967**

Ernothrips immsi (Bagnall 1926). Distribution: India (Uttar Pradesh).

Ernothrips lobatus (Bhatti 1967).

Distribution: India (Himachal Pradesh, Madhya Pradesh, Tamil Nadu, Uttar Pradesh).

***Euphysothrips* Bagnall 1926**

Euphysothrips minozzii Bagnall 1926. Distribution: India (Maharashtra, Tamil Nadu).

Euphysothrips subramanii (Ramakrishna & Margabandhu 1939). Distribution: India (Karnataka, Tamil Nadu, West Bengal*).

***Exothrips* Priesner 1939**

Exothrips ananthakrishnani Bhatti 1975. Distribution: India (Tamil Nadu).

Exothrips anolis (Bhatti 1967). Distribution: India (Madhya Pradesh).

Exothrips cephalicus Bhatti 1975. Distribution: India (Delhi, Madhya Pradesh).

Exothrips deemax Bhatti 1975. Distribution: India (Delhi).

Exothrips hemavarna (Ramakrishna & Margabandhu 1931). Distribution: India (Chandigarh, Delhi, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Uttar Pradesh*, Tamil Nadu, West Bengal).

Exothrips jammuensis Vijay Veer & Srivastava 1985. Distribution: India (Jammu & Kashmir).

Exothrips ornus Bhatti 1975. Distribution: India (Delhi).

Exothrips poorva Bhatti 1975. Distribution: India (Delhi).

Exothrips redox Bhatti 1975. Distribution: India (Delhi, Jammu & Kashmir, Punjab).

Exothrips sacchari (Moulton 1936). Distribution: India (Punjab).

Checklist-Thrips of India

Exothrips sakimurai (Ananthakrishnan 1961). Distribution: India (Tamil Nadu).
Exothrips shweta Bhatti & Ananthakrishnan 1978. Distribution: India (Tamil Nadu).

***Florithrips* Bhatti 1970**

Florithrips traegardhi (Trybom 1911).
Distribution: India (Andhra Pradesh, Delhi, Madhya Pradesh, Maharashtra, Punjab, Tamil Nadu, Uttar Pradesh*).

***Foliothrips* Bhatti 1972**

Foliothrips oratus Bhatti 1972. Distribution: India (Delhi, Maharashtra).

***Frankliniella* Karny 1910**

Frankliniella insularis (Franklin 1908).
Distribution: India.

Frankliniella intonsa (Trybom 1895).
Distribution: India (Bihar, West Bengal, Meghalaya).

Frankliniella occidentalis (Pergande 1895).
Distribution: India (Karnataka).

Frankliniella schultzei (Trybom 1910).
Distribution: India (Andaman Island, Delhi, Karnataka, Meghalaya, Tamil Nadu, Uttar Pradesh, West Bengal).

Frankliniella unicolor Morgan 1925.
Distribution: India (Kerala).

***Fulmekiola* Karny 1925**

Fulmekiola serrata (Kobus 1892).
Distribution: India (Haryana, Punjab, Uttar Pradesh).

***Gnomonothrips* Ramakrishna & Margabandhu 1939**

Gnomonothrips coimbatorensis Ramakrishna & Margabandhu 1939. Distribution: India (Tamil Nadu).

***Indusiothrips* Priesner 1952**

Indusiothrips seshadri Priesner 1952.
Distribution: India (Tamil Nadu).

***Jakthrips* Bhatti & Ranganath 2006**

Jakthrips ignacimuthui Bhatti & Ranganath 2006. Distribution: India (Karnataka).

***Kurtomathrips* Moulton 1927**

Kurtomathrips morrilli Moulton 1927.
Distribution: India (Delhi, Karnataka).

***Laplothrips* Bhatti 1972**

Laplothrips bicolor Bhatti 1972. Distribution: India (Uttar Pradesh).

***Lefroyothrips* Priesner 1938**

Lefroyothrips lefroyi (Bagnall 1913).
Distribution: India (Assam, Himachal Pradesh, Punjab, Uttarakhand, West Bengal).

Lefroyothrips obscurus (Ananthakrishnan & Jagadish 1966). Distribution: India (Tamil Nadu).

***Limothrips* Haliday 1836**

Limothrips cerealium (Haliday 1836).
Distribution: The only recorded material from India is the head and prothorax of a single specimen from Coimbatore (Tamil Nadu) (Bhatti 1990: 238).

***Megalurothrips* Bagnall 1915**

Megalurothrips distalis (Karny 1913).
Distribution: India (Andaman Island, Arunachal Pradesh, Meghalaya, Tamil Nadu, Tripura, Uttar Pradesh*, West Bengal).

Megalurothrips mucunae (Priesner 1938).
Distribution: India (Assam).

Megalurothrips peculiaris (Bagnall 1918).
Distribution: India (Bihar, Delhi, Karnataka, Manipur, Meghalaya, Punjab, Tamil Nadu, Uttar Pradesh).

Megalurothrips typicus Bagnall 1915.
Distribution: India (Andhra Pradesh, Madhya Pradesh, Maharashtra, Tamil Nadu).

Megalurothrips usitatus (Bagnall 1913).
Distribution: India (Delhi, Karnataka, Tamil Nadu, Uttar Pradesh).

Microcephalothrips Bagnall 1926

Microcephalothrips abdominalis (D. L. Crawford 1910). Distribution: India (Arunachal Pradesh, Delhi, Himachal Pradesh*, Karnataka, Meghalaya, Punjab, West Bengal).

Moundinothrips Bhatti 1999

Moundinothrips robustus (Bhatti 1995).
Distribution: India (Himachal Pradesh, Punjab).

Mycterothrips Trybom 1910

Mycterothrips acaciae Priesner 1932.
Distribution: India (Haryana, Madhya Pradesh, Maharashtra, Uttar Pradesh*).

Mycterothrips chaetogastra (Ramakrishna 1934). Distribution: India (Tamil Nadu).

Mycterothrips nilgiriensis (Ananthakrishnan 1960). Distribution: India (Himachal Pradesh, Jammu & Kashmir, Madhya Pradesh, Maharashtra, Punjab, Tamil Nadu, Uttar Pradesh).

Mycterothrips ricini (Shumsher 1946).
Distribution: India (Delhi, Himachal Pradesh, Madhya Pradesh, Maharashtra, Rajasthan).

Mycterothrips setiventris (Bagnall 1918).
Distribution: India (West Bengal).

Neocorynothrips Ramakrishna & Margabandhu 1939

Neocorynothrips asiaticus Ramakrishna & Margabandhu 1939. Distribution: India (Kerala, Tamil Nadu).

Octothrips Moulton 1940

Octothrips bhattii (Wilson 1972).
Distribution: India (Madhya Pradesh).

Odontothrips Amyot & Serville, 1843

Odontothrips moringa Tyagi & Kumar 2016.
Distribution: India (Rajasthan).

Organothrips Hood 1940

Organothrips indicus Bhatti 1974.
Distribution: India (Delhi, Maharashtra, West Bengal).

Oxythrips Uzel 1895

Oxythrips indicus Bhatti 1967. Distribution: India (Himachal Pradesh).

Oxythrips kochummani Ananthakrishnan 1969. Distribution: India (Himachal Pradesh).

Palmiothrips Bhatti 1978

Palmiothrips palmae (Ramakrishna 1934).
Distribution: India (Karnataka, Tamil Nadu).

Parabaliiothrips Priesner 1935

Parabaliiothrips takahashii Priesner 1935.
Distribution: India (Himachal Pradesh).

Parexothrips Priesner 1965

Parexothrips capitis Bhatti 1975.
Distribution: India (Jammu & Kashmir).

Checklist-Thrips of India

Parexothrips tenellus (Priesner 1950).
Distribution: India (Delhi).

Plutonothrips Priesner 1933

Plutonothrips cus (Bhatti 1967).
Distribution: India (Delhi, Karnataka, Madhya Pradesh, Punjab, Uttar Pradesh).

Priesneriola Ananthakrishnan 1964

Priesneriola oneillae Ananthakrishnan 1964.
Distribution: India (Delhi, Maharashtra, Punjab, Tamil Nadu, Uttar Pradesh*, West Bengal).

Projectothrips Moulton 1929

Projectothrips bhattii Ananthakrishnan 1973. Distribution: India (Tamil Nadu).
Projectothrips pruthi Moulton 1929.
Distribution: India (Tamil Nadu, West Bengal).

Psilothrips Hood 1927

Psilothrips indicus Bhatti 1967.
Distribution: India (Delhi).

Rhamphothrips Karny 1913

Rhamphothrips aureus (Ananthakrishnan 1954). Distribution: India (Andaman Island, Maharashtra, Tamil Nadu).
Rhamphothrips bhattii Tyagi & Kumar 2013.
Distribution: India (Odisha, West Bengal).
Rhamphothrips jasminae (Bhatti 1977).
Distribution: India (Delhi, Kerala).
Rhamphothrips pardus (Bhatti 1967).
Distribution: India (West Bengal).
Rhamphothrips pandens Sakimura 1983.
Distribution: India.
Rhamphothrips parviceps (Hood 1919).
Distribution: India (Delhi, Madhya

Pradesh, Maharashtra, Tamil Nadu, West Bengal).

Rhamphothrips santokhi Kulshrestha & Vijay Veer 1984. Distribution: India (Uttar Pradesh).

Salpingothrips Hood 1935

Salpingothrips hoodi Ananthakrishnan 1969.
Distribution: India (Delhi).

Sciothrips Bhatti 1970

Sciothrips cardamomi (Ramakrishna 1935).
Distribution: India (Arunachal Pradesh, Tamil Nadu).

Scirtothrips Shull 1909

Scirtothrips bispinosus (Bagnall 1924).
Distribution: India (Karnataka, Tamil Nadu).

Scirtothrips dorsalis Hood 1919.
Distribution: India (Andhra Pradesh, Assam, Delhi, Gujarat, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Meghalaya, Odisha, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, West Bengal).

Scirtothrips fulleri Faure 1929. Distribution: India (Tamil Nadu).

Scirtothrips kenyensis Mound 1968.
Distribution: India (Himachal Pradesh)

Scirtothrips oligochaetus (Karny 1927).
Distribution: India (Andhra Pradesh, Delhi, Madhya Pradesh, Maharashtra, Rajasthan, Uttar Pradesh),

Scirtothrips mangiferae Priesner 1932.
Distribution: India (Delhi, Karnataka, Madhya Pradesh).

Scirtothrips pteridicola Ananthakrishnan 1968. Distribution: India (Tamil Nadu).

***Scolothrips* Hinds 1902**

Scolothrips asura Ramakrishna & Margabandhu 1931. Distribution: India (Delhi, Karnataka, Maharashtra, Tamil Nadu, West Bengal).

Scolothrips rhagebianus Priesner 1950. Distribution: India (Delhi, Karnataka, West Bengal).

Scolothrips tenuipennis zur strassen 1965. Distribution: India (Delhi).

***Smeringothrips* Priesner 1938**

Smeringothrips salaciae Priesner 1938. Distribution: India (Madhya Pradesh).

***Smilothrips* Bhatti 1976**

Smilothrips productus Bhatti 1976. Distribution: India (Himachal Pradesh).

***Sorghothrips* Priesner 1936**

Sorghothrips fuscus (Ananthakrishnan 1965). Distribution: India (Delhi, Haryana, Kerala).

Sorghothrips jonnaphilus (Ramakrishna 1928). Distribution: India (Andhra Pradesh, Delhi, Gujarat, Maharashtra, Tamil Nadu).

***Sphaeropothrips* Priesner 1928**

Sphaeropothrips vittipennis (Bagnall 1927). Distribution: India (Haryana, Uttar Pradesh).

***Stenchaetothrips* Bagnall 1926**

Stenchaetothrips aralis Bhatti 1982. Distribution: India (Madhya Pradesh).

Stenchaetothrips bambusae (Shumsher 1946). Distribution: India (Maharashtra, Rajasthan, Tamil Nadu), Burma.

Stenchaetothrips bicolor (Ananthakrishnan & Jagadish 1967). Distribution: India (Meghalaya, Tamil Nadu).

Stenchaetothrips biformis (Bagnall 1913). Distribution: India (Delhi, Chandigarh, Himachal Pradesh, Karnataka, Odisha, Madhya Pradesh, Meghalaya, Sikkim, Tamil Nadu, Uttar Pradesh, West Bengal, widely distributed).

Stenchaetothrips caulis Bhatti 1982. Distribution: India (Tamil Nadu).

Stenchaetothrips dissidens (Ananthakrishnan & Jagadish 1967). Distribution: India (Tamil Nadu).

Stenchaetothrips divisae Bhatti 1982. Distribution: India (West Bengal).

Stenchaetothrips faurei (Bhatti 1962). Distribution: India (Delhi, Haryana, Jammu & Kashmir, Karnataka, Punjab, Uttar Pradesh).

Stenchaetothrips glandularis (Ananthakrishnan & Jagadish 1967). Distribution: India (Tamil Nadu, Tripura).

Stenchaetothrips graminis (Ananthakrishnan & Jagadish 1967). Distribution: India (Kerala, Tamil Nadu).

Stenchaetothrips hullikali Tyagi & Kumar 2008. Distribution: India (Karnataka).

Stenchaetothrips indicus (Ramakrishna & Margabandhu 1931). Distribution: India (Andhra Pradesh, Delhi, Karnataka, Maharashtra, Punjab, West Bengal).

Stenchaetothrips minutus (van Deventer 1906). Distribution: India (Tamil Nadu).

Stenchaetothrips melaneurus Bagnall 1926. Distribution: India (West Bengal).

Stenchaetothrips pteratus Bhatti 1982. Distribution: India (Himachal Pradesh).

Stenchaetothrips sciurus Bhatti 1982. Distribution: India (Uttar Pradesh).

Checklist-Thrips of India

Stenchaetothrips spinulae Tyagi & Kumar 2008. Distribution: India (Karnataka, West Bengal).

Stenchaetothrips tenebricus (Ananthakrishnan & Jagadish 1968). Distribution: India (Tamil Nadu).

Taeniothrips Amyot & Serville 1843

Taeniothrips bharokariiensis Kumar & Tyagi 2014. Distribution: India (Himachal Pradesh).

Taeniothrips major Bagnall 1916. Distribution: India (Himachal Pradesh, Meghalaya, Uttar Pradesh).

Taeniothrips orchidi Ananthakrishnan 1968. Distribution: India (Uttar Pradesh).

Taeniothrips tigris Bhatti 1995. Distribution: India.

Tameothrips Bhatti 1978

Tameothrips arundo Tyagi & Kumar 2015. Distribution: India (Himachal Pradesh).

Tenothrips Bhatti 1967

Tenothrips frici (Uzel 1895). Distribution: India (Delhi, Jammu & Kashmir).

Thrips Linneaus 1758

Thrips alatus Bhatti 1980. Distribution: India (Uttar Pradesh).

Thrips andrewsi (Bagnall 1921). Distribution: India (Assam, Chandigarh, Himachal Pradesh, Punjab, Uttar Pradesh, West Bengal).

Thrips apicatus Priesner 1934. Distribution: India (Andhra Pradesh, Delhi, Karnataka, Kerala, Madhya Pradesh, Tamil Nadu, Uttar Pradesh*, West Bengal).

Thrips arorai Bhatti 1980. Distribution: India (Punjab, Himachal Pradesh, Uttar Pradesh).

Thrips atactus Bhatti 1967. Distribution: India (West Bengal).

Thrips beharensis (Ramakrishna & Margabandhu 1939). Distribution: India (Bihar, Sikkim, West Bengal).

Thrips carthami Shumsher 1946. Distribution: India (Delhi, Himachal Pradesh, Jammu & Kashmir).

Thrips cedri Bhatti 1980. Distribution: India (Himachal Pradesh).

Thrips chandni Bhatti 1999. Distribution: India (Delhi, Punjab).

Thrips coloratus Schmutz 1913. Distribution: India (Delhi, Jammu & Kashmir, Himachal Pradesh, Maharashtra, Meghalaya, Punjab, Rajasthan, Sikkim, Tamil Nadu, Uttar Pradesh, West Bengal).

Thrips dorax Bhatti 1980. Distribution: India (Himachal Pradesh).

Thrips flavidulus (Bagnall 1923). Distribution: India (Assam, Chandigarh, Himachal Pradesh, Uttar Pradesh).

Thrips flavus Schrank 1776. Distribution: India (Delhi, Goa, Haryana, Jammu & Kashmir, Himachal Pradesh, Meghalaya, Punjab, Sikkim, Tripura, Tamil Nadu, Uttar Pradesh, West Bengal).

Thrips florum Schmutz 1913. Distribution: India (Andaman Island, Delhi, Karnataka, Punjab, widely distributed).

Thrips garuda Bhatti 1980. Distribution: India (Delhi, Punjab).

Thrips hawaiiensis (Morgan 1913). Distribution: India (Andaman Island, Assam, Delhi, Karnataka, Meghalaya, Sikkim, West Bengal, widely distributed).

Thrips hispidus Ananthakrishnan & Jagadish 1966. Distribution: India (Kerala, Madhya Pradesh, Meghalaya, Tamil Nadu).

Thrips kodaikanalensis Ananthakrishnan & Jagadish 1966. Distribution: India (Tamil Nadu).

Thrips latis Bhatti 1967. Distribution: India (Madhya Pradesh, Tamil Nadu, West Bengal).

Thrips levatus Bhatti 1980. Distribution: India (Assam, Maharashtra).

Thrips longiceps (Bagnall 1916). Distribution: India (Meghalaya, Uttar Pradesh).

Thrips malloti Priesner 1934. Distribution: India (Karnataka, Madhya Pradesh).

Thrips mirus Bhatti 1967. Distribution: India (Maharashtra, Tamil Nadu).

Thrips moundi Tyagi & Kumar 2015. Distribution: India (Himachal Pradesh).

Thrips orientalis (Bagnall 1915). Distribution: India (Delhi, Karnataka, Maharashtra, Punjab, Tripura, Tamil Nadu, Uttar Pradesh*, West Bengal).

Thrips pallidulus Bagnall 1924. Distribution: India (Bihar).

Thrips palmi Karny 1925. Distribution: India (Delhi, Karnataka, Odisha*, Punjab, widely distributed).

Thrips parvispinus (Karny 1912). Distribution: India (Karnataka).

Thrips rostratus Priesner 1934. Distribution: India (Tamil Nadu).

Thrips sensarmai Vijay Veer & Srivastava 1985. Distribution: India (West Bengal).

Thrips simplex (Morison 1930). Distribution: India (Andhra Pradesh*, Karnataka*, Tamil Nadu).

Thrips speratus zur Strassen 1978. Distribution: India (Delhi, Tamil Nadu).

Thrips subnudula (Karny 1927). Distribution: India (Delhi, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Odisha, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh*, West Bengal).

Thrips tabaci Lindeman 1889. Distribution: India (Delhi, Karnataka, Meghalaya, Punjab, West Bengal, widely distributed).

Thrips tanicus Bhatti 1970. Distribution: India (Tamil Nadu).

Thrips taurus Bhatti 1980. Distribution: India (Uttar Pradesh).

Thrips trehernei Priesner 1927. Distribution: India (Jammu & Kashmir, Uttar Pradesh).

Thrips vitticornis (Karny 1922). Distribution: India (Tamil Nadu).

Thrips xenos Bhatti 1980. Distribution: India (Himachal Pradesh).

Trichromothrips Priesner 1930

Trichromothrips albus (Bhatti 1978). Distribution: India (Uttar Pradesh).

Trichromothrips alis Bhatti 1967. Distribution: India (Madhya Pradesh).

Trichromothrips arorai Bhatti 1967. Distribution: India (Karnataka, Tamil Nadu, West Bengal).

Trichromothrips falcus Bhatti, 1999. Distribution: India (Madhya Pradesh, West Bengal).

Trichromothrips fasciatus (Ananthakrishnan 1965). Distribution: India (Madhya Pradesh, Maharashtra, Tamil Nadu, West Bengal).

Trichromothrips flavidus (Bhatti 1978). Distribution: India (Karnataka).

Checklist-Thrips of India

Trichromothrips indicus (Bhatti 1978).
Distribution: India (West Bengal).

Trichromothrips nilgiricus (Ramakrishnan & Margabandhu 1939). Distribution: India (Tamil Nadu).

Trichromothrips priesneri (Bhatti 1967).
Distribution: India (Karnataka, Madhya Pradesh, Tamil Nadu, Uttar Pradesh).

Trichromothrips similis (Ananthakrishnan 1968). Distribution: India (Tamil Nadu, West Bengal).

Trichromothrips walteri (J.C. Crawford 1941). Distribution: India (Karnataka, Madhya Pradesh, Maharashtra, Tamil Nadu, West Bengal).

***Tusothrips* Bhatti 1967**

Tusothrips setiprivus (Karny 1927).
Distribution: India (Tamil Nadu, West Bengal).

Tusothrips sumatrensis (Karny 1925).
Distribution: India (Delhi, Jammu & Kashmir, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh*, West Bengal).

Suborder Tubulifera

Family Phlaeothripidae

Subfamily Idolothripinae

***Acallurothrips* Bagnall 1921**

Acallurothrips amplus (Faure 1949).
Distribution: India (Kerala, Tamil Nadu).

***Aesthesiothrips* Ananthakrishnan 1961**

Aesthesiothrips jatrophae Ananthakrishnan 1961. Distribution: India (Uttarakhand).

***Allothrips* Hood 1908**

Allothrips bicolor Ananthakrishnan 1964.
Distribution: India (Andhra Pradesh, Karnataka, Kerala, Tamil Nadu, Uttar Pradesh*, West Bengal).

Allothrips indicus Ananthakrishnan 1958.
Distribution: India (Tamil Nadu).

Allothrips montanus Ananthakrishnan 1968. Distribution: India (Madhya Pradesh).

Allothrips watsoni Hood 1939. Distribution: India (Delhi).

***Bactrothrips* Karny 1912**

Bactrothrips idolomorphus (Karny 1919).
Distribution: India (Kerala, Manipur, Uttar Pradesh).

Bactrothrips luteus Ananthakrishnan 1973.
Distribution: India (Uttar Pradesh).

***Compsothrips* Reuter 1901**

Compsothrips congoensis (Hood 1952).
Distribution: India (Andhra Pradesh, Tamil Nadu).

Compsothrips *ramamurthii* (Ananthakrishnan 1964). Distribution: India (Andhra Pradesh, Tamil Nadu).

***Diaphorothrips* Karny 1920**

Diaphorothrips unguipes Karny 1920.
Distribution: India (Karnataka, Kerala, Tamil Nadu).

***Dinothrips* Bagnall 1908**

Dinothrips juglandis Moulton 1933.
Distribution: India (West Bengal).

Dinothrips longicauda (Ananthakrishnan, 1961). Distribution: India Maharashtra.

Dinothrips spinosus (Schmutz, 1913).
Distribution: India (Karnataka, Kerala, Uttarakhand).

Dinothrips sumatrensis Bagnall, 1908.
Distribution: India (Arunachal Pradesh, Assam, Karnataka, Kerala, Meghalaya, Tamil Nadu, Tripura).

***Ethirothrips* Karny 1925**

Ethirothrips anacardii (Ananthakrishnan 1969). Distribution: India (Kerala).

Ethirothrips beelsoni (Moulton 1928). Distribution: India (Uttarakhand).

Ethirothrips brevisetosus (Ananthakrishnan & Jagadish 1970). Distribution: India (Andhra Pradesh, Kerala).

Ethirothrips brevis (Bagnall 1921). Distribution: India (Kerala, Tamil Nadu).

Ethirothrips indicus (Bagnall 1921). Distribution: India (Uttarakhand).

Ethirothrips longisetis (Ananthakrishnan & Jagadish 1970). Distribution: India (West Bengal).

Ethirothrips obscurus (Schmutz 1913). Distribution: India (Andhra Pradesh, Bihar, Tamil Nadu, Uttarakhand, West Bengal).

Ethirothrips uredinis (Ananthakrishnan & Jagadish 1970). Distribution: India (Tamil Nadu).

Ethirothrips vitreipennis (Priesner 1939). Distribution: India (Himachal Pradesh, Kerala).

Ethirothrips tirumalaiensis (Ananthakrishnan 1969). Distribution: India (Andhra Pradesh).

***Elaphrothrips* Buffa 1909**

Elaphrothrips curvipes Priesner 1929. Distribution: (Karnataka, Kerala, Maharashtra, Manipur, Meghalaya, Sikkim, Tamil Nadu, West Bengal).

Elaphrothrips denticollis (Bagnall 1909). Distribution: India (Assam, Karnataka, Kerala, Meghalaya, Sikkim, Tamil Nadu, Tripura, West Bengal).

Elaphrothrips greeni (Bagnall 1914). Distribution: India (Karnataka).

Elaphrothrips insignis Ananthakrishnan 1973. Distribution: India (Uttar Pradesh, West Bengal).

Elaphrothrips notabilis Ananthakrishnan 1973. Distribution: India (Andhra Pradesh, Karnataka, Kerala, Tamil Nadu).

Elaphrothrips procer (Schmutz 1913). Distribution: India (Karnataka, Kerala, Maharashtra, Manipur, Meghalaya, Sikkim, Tamil Nadu, Tripura, West Bengal).

Elaphrothrips spiniceps Bagnall 1932. Distribution: India (Meghalaya, Uttar Pradesh).

***Gastrothrips* Hood 1912**

Gastrothrips acuticornis (Hood 1925). Distribution: India (Andhra Pradesh, Kerala, Tamil Nadu).

Gastrothrips falcatus (Ananthakrishnan 1968). Distribution: India (Andhra Pradesh, Goa, Karnataka, Kerala, Tamil Nadu).

Gastrothrips turbinatus (Ananthakrishnan 1967). Distribution: India (Karnataka, Tamil Nadu).

***Ischyrothrips* Schmutz 1913**

Ischyrothrips crassus Schmutz 1913. Distribution: India (Andhra Pradesh).

***Loyolaia* Ananthakrishnan 1964**

Checklist-Thrips of India

Loyolaia indica Ananthakrishnan 1964.
Distribution: India (Tamil Nadu, West Bengal).

Machatothrips Bagnall 1908

Machatothrips corticosus Ananthakrishnan 1972. Distribution: India (Kerala).

Machatothrips indicus Ananthakrishnan & Jagadish 1970. Distribution: India (Karnataka, Kerala).

Machatothrips silvaticus Ananthakrishnan 1972. Distribution: India (Madhya Pradesh).

Meiothrips Priesner 1929

Meiothrips menoni Ananthakrishnan 1964. Distribution: India (Andhra Pradesh, Karnataka, Kerala).

Meiothrips nepalensis Kudo & Ananthakrishnan 1974. Distribution: India (Manipur).

Neosmerinthothrips Schmutz 1913

Neosmerinthothrips fructuum Schmutz 1913. Distribution: India (Andaman Island, Andhra Pradesh, Karnataka, Kerala, Madhya Pradesh, Meghalaya, Tamil Nadu, West Bengal).

Neosmerinthothrips inquilinus Ananthakrishnan 1961. Distribution: India (Tamil Nadu).

Neosmerinthothrips robustus (Ananthakrishnan 1964). Distribution: India (Andhra Pradesh, Goa, Kerala, Tamil Nadu).

Nesidiothrips Mound 1974

Nesidiothrips alius (Ananthakrishnan 1970). Distribution: India (Andhra Pradesh, Kerala).

Nesothrips Kirkaldy 1907

Nesothrips brevicollis (Bagnall 1914). Distribution: India (Kerala, Madhya Pradesh).

Nesothrips lativentris (Karny 1913). Distribution: India (Andaman Island, Arunachal Pradesh, Meghalaya, Tripura, West Bengal).

Mecynothrips Bagnall 1908

Mecynothrips simplex Bagnall 1912. Distribution: India (Karnataka, Kerala, Manipur).

Ophthalmothrips Hood 1919

Ophthalmothrips breviceps (Bagnall 1914). Distribution: India (Himachal Pradesh).

Ophthalmothrips faurei (Ananthakrishnan 1964). Distribution: India (Kerala, Tamil Nadu).

Priesneriana Ananthakrishnan 1956

Priesneriana kabandha (Ramakrishna 1928). Distribution: India (Karnataka, Kerala, Tamil Nadu).

Tiarothrips Priesner 1935

Tiarothrips subramanii (Ramakrishna 1925). Distribution: India (Tamil Nadu).

Phlaeothripinae

Ablemothrips Ananthakrishnan 1969

Ablemothrips maxillatus Ananthakrishnan 1969. Distribution: India (Tamil Nadu, West Bengal).

Aclystothrips Ananthakrishnan 1971

Aclystothrips aberrans Ananthakrishnan 1973. Distribution: India (Andhra Pradesh).

Aclystothrips priesneri Ananthakrishnan 1972. Distribution: India (Karnataka).

***Adraneothrips* Hood 1925**

Adraneothrips bambusae (Ananthakrishnan 1964). Distribution: India (Kerala).

Adraneothrips disjunctus Ananthakrishnan 1972. Distribution: India (Andhra Pradesh).

Adraneothrips elegans Ananthakrishnan 1972. Distribution: India (Kerala).

Adraneothrips infirmus (Ananthakrishnan 1971). Distribution: India (West Bengal).

Adraneothrips limpidus Ananthakrishnan 1964. Distribution: India (Kerala, Tamil Nadu).

Adraneothrips *madrasensis* Ananthakrishnan 1968. Distribution: India (Tamil Nadu).

Adraneothrips *nilgiriensis* (Ananthakrishnan 1971). Distribution: India (Tamil Nadu).

Adraneothrips okajimai (Muraleedharan & Sen 1981). Distribution: India (Andaman Island, Manipur, Meghalaya, Tripura).

Adraneothrips pteris (Ananthakrishnan 1971). Distribution: India (Tamil Nadu).

Adraneothrips stannardi Ananthakrishnan 1969. Distribution: India (Tamil Nadu).

***Aeglothrips* Ananthakrishnan 1969**

Aeglothrips denticulus Ananthakrishnan 1969. Distribution: India (Kerala).

***Agrothrips* Jacot-Guillarmod 1939**

Agrothrips insolitus Ananthakrishnan 1969. Distribution: India (Andhra Pradesh).

Ahamothrips Kumar, Tyagi & Bhatti 2007

Ahamothrips maxima Kumar, Tyagi & Bhatti 2007. Distribution: India (Delhi).

***Alerothrips* Bhatti 1995**

Alerothrips indicus (Ananthakrishnan 1964). Distribution: India (Andhra Pradesh, Delhi, Maharashtra, Rajasthan, Tamil Nadu).

***Aleurodothrips* Franklin 1909**

Aleurodothrips fasciapennis (Franklin 1908). Distribution: India (Andaman Island, Karnataka*, Kerala, Tamil Nadu, West Bengal).

***Alocothrips* Priesner 1952**

Alocothrips hadrocerus (Karny 1926). Distribution: India (Tamil Nadu).

***Alloiothrips* Ananthakrishnan 1964**

Alloiothrips nigrisetis Ananthakrishnan 1964. Distribution: India (Tamil Nadu).

***Ananthakrishnana* Bhatti 1967**

Ananthakrishnana euphorbiae (Priesner 1931). Distribution: India (Andhra Pradesh, Delhi, Maharashtra).

***Androthrips* Karny 1911**

Androthrips coimbatorensis Ramakrishna 1934. Distribution: India (Tamil Nadu).

Androthrips flavipes Schmutz 1913. Distribution: India (Assam, Kerala, Meghalaya, Tamil Nadu, Tripura).

Androthrips flavitibia Moulton 1933. Distribution: India (Andaman Island, Assam, Manipur, Tripura, Uttarakhand).

Androthrips melastomae (Zimmermann 1900). Distribution: India (Tamil Nadu).

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Androthrips ramachandrai Karny 1926.
Distribution: India (Assam, Arunachal Pradesh, Tamil Nadu).

***Apelaunothrips* Karny 1925**

Apelaunothrips bhowalii (Ananthakrishnan 1972). Distribution: India (Meghalaya, Uttar Pradesh).

Apelaunothrips consimilis (Ananthakrishnan 1969). Distribution: India (Karnataka, Kerala, Tripura).

Apelaunothrips indicus (Ananthakrishnan 1967). Distribution: India (Tamil Nadu).

Apelaunothrips lucidus (Ananthakrishnan 1965). Distribution: India (Kerala, Tamil Nadu).

Apelaunothrips madrasensis (Ananthakrishnan 1964). Distribution: India (Kerala, Manipur, Tamil Nadu).

***Aphlothrips* Kumar & Tyagi 2007**

Aphlothrips virktamathai Kumar & Tyagi 2007. Distribution: India (Uttar Pradesh).

***Apterygothrips* Priesner 1933**

Apterygothrips banyan Bhatti 1997. Distribution: India (Delhi).

Apterygothrips bournieri Bhatti & Mehra 1994. Distribution: India (Punjab).

Apterygothrips dempax Bhatti & Ananthakrishnan 1978. Distribution: India (Andhra Pradesh).

Apterygothrips fungosus (Ananthakrishnan & Jagadish 1969). Distribution: India (Tamil Nadu).

Apterygothrips hispanicus (Bagnall 1916). Distribution: India (Uttarakhand).

Apterygothrips jogensis Ananthakrishnan & Jagadish 1969). Distribution: India (Karnataka).

Apterygothrips pellucidus (Ananthakrishnan 1968). Distribution: India (Delhi*, Haryana, Tamil Nadu).

Apterygothrips rubriginosus (Ananthakrishnan & Jagadish 1971). Distribution: India (Tamil Nadu).

***Araeothrips* Ananthakrishnan 1976**

Araeothrips duibongensis (Nilamani & Prasad 1991). Distribution: India (Manipur).

Araeothrips longisetis Ananthakrishnan 1976. Distribution: India (Arunachal Pradesh, Madhya Pradesh).

Araeothrips vamana Muraleedharan 1982. Distribution: India (Manipur).

***Arrhenothrips* Hood 1919**

Arrhenothrips acuminatus Ananthakrishnan 1969. Distribution: India (Andhra Pradesh).

Arrhenothrips brevis Ananthakrishnan & Swaminathan 1980. Distribution: India (Karnataka).

Arrhenothrips dhumrapaksha Ramakrishna 1928. Distribution: India (Karnataka).

Arrhenothrips longisetis Sen 1977. Distribution: India (West Bengal).

Arrhenothrips ramakrishnae Hood 1919. Distribution: India (Karnataka, Tamil Nadu, West Bengal).

***Ataliothrips* Bhatti 1995**

Ataliothrips reuteri (Bagnall 1913). Distribution: India (Delhi, Uttar Pradesh).

***Athlibothrips* Priesner 1952**

Athlibothrips inquilinus (Ananthakrishnan & Varadarasan 1978). Distribution: India (Bihar).

Athlibothrips manipurensis Muraleedharan 1982. Distribution: India (Manipur).

Athlibothrips yercaudensis Muraleedharan & Sen, 198. Distribution: India (Tamil Nadu).

Austrothrips Brethes 1915

Austrothrips cochinchinensis Karny 1922. Distribution: India (Kerala, Tamil Nadu).

Ayyarothrips Ananthakrishnan 1972

Ayyarothrips abstrusus Ananthakrishnan 1972. Distribution: India (Karnataka).

Azaleothrips Ananthakrishnan 1964

Azaleothrips amabilis Ananthakrishnan 1964. Distribution: India (Goa, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Tamil Nadu, Uttar Pradesh, West Bengal).

Azaleothrips aspersus Bhatti 1995. Distribution: India (Delhi, Maharashtra).

Azaleothrips bhattii Vijay Veer & Chauhan 1990. Distribution: India (Delhi, Uttarakhand).

Azaleothrips lineus Bhatti 1995. Distribution: India (Delhi, Maharashtra).

Bamboosiella Ananthakrishnan 1957

Bamboosiella bicoloripes Ananthakrishnan 1957. Distribution: India (Tamil Nadu).

Bamboosiella graminella (Ananthakrishnan & Jagadish 1969). Distribution: India (Andhra Pradesh, Karnataka).

Bamboosiella malabarica (Ananthakrishnan 1965). Distribution: India (Delhi, Kerala, Tamil Nadu).

Bamboosiella microptera (Pitkin 1976). Distribution: India (Kerala).

Bamboosiella nayari (Ananthakrishnan 1958). Distribution: India (Kerala, West Bengal).

Bamboosiella varia (Ananthakrishnan & Jagadish 1969). Distribution: India (Delhi, Karnataka, Kerala, Uttarakhand, West Bengal).

Bamboosiella venkataramani Kumar & Tyagi 2014. Distribution: India (Karnataka).

Baenothrips Crawford 1948

Baenothrips asper (Bournier 1963). Distribution: India (Andaman Island, Andhra Pradesh, Kerala, Manipur, Tamil Nadu).

Baenothrips indicus (Ananthakrishnan 1966). Distribution: India (Delhi, Kerala, Tamil Nadu).

Baenothrips minutus (Ananthakrishnan 1964). Distribution: India (Tamil Nadu).

Brachythrips Reuter 1899

Brachythrips dhirgavadana Ramakrishna 1928. Distribution: India (Karnataka).

Bradythrips Hood & Williams 1925

Bradythrips hesperus Hood & Williams 1925. Distribution: India (Kerala).

Bunothrips Ananthakrishnan 1969

Bunothrips cruralis Ananthakrishnan 1969. Distribution: India (Kerala).

Byctothrips Ananthakrishnan 1973

Byctothrips ayyari Ananthakrishnan 1973. Distribution: India (Karnataka, Tamil Nadu).

Calamothrips Ananthakrishnan 1967

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Calamothrips fastigiatus Ananthakrishnan 1967. Distribution: India (Tamil Nadu).

Carissothrips Ananthakrishnan 1964

Carissothrips nigrescens Ananthakrishnan 1964. Distribution: India (Andhra Pradesh).

Chiraplothrips Priesner 1931

Chiraplothrips graminellus Priesner 1939. Distribution: India (Tamil Nadu).

Chiridothrips Ramakrishna & Margabandhu 1939

Chiridothrips indicus Ramakrishna & Margabandhu 1939. Distribution: India (Tamil Nadu).

Chlarathrips Ananthakrishnan 1967

Chlarathrips tersus Ananthakrishnan 1967. Distribution: India (Kerala, Tamil Nadu).

Corycidothrips Ananthakrishnan 1972

Corycidothrips inquilinus Ananthakrishnan 1972. Distribution: India (Kerala).

Crotonothrips Ananthakrishnan 1968

Crotonothrips cacharensis Muraleedharan & Sen 1978. Distribution: India (Assam, Tripura).

Crotonothrips coorgensis Ananthakrishnan 1976. Distribution: India (Karnataka).

Crotonothrips dantahasta (Ramakrishna 1928). Distribution: India (Karnataka).

Crotonothrips davidi Ananthakrishnan 1972. Distribution: India (Tamil Nadu).

Crotonothrips dissimilis Ananthakrishnan 1976. Distribution: India (Tamil Nadu).

Crotonothrips erraticus Muraleedharan & Sen 1981. Distribution: India (Tripura).

Crotonothrips gallarum Ananthakrishnan 1968. Distribution: India (Karnataka).

Crotonothrips longirostris Muraleedharan & Sen 1981. Distribution: India (Tripura).

Crotonothrips maoensis Nilamani & Prasad 1990. Distribution: India (Manipur).

Crotonothrips memecylonicus Ananthakrishnan 1976. Distribution: India (Kerala).

Crotonothrips mimicus (Ananthakrishnan 1969). Distribution: India (Kerala)

Crotonothrips nagaensis Muraleedharan 1982. Distribution: India (Manipur).

Crotonothrips nelliampathiensis Varatharajan & Chochong 2000. Distribution: India (Manipur).

Crotonothrips parvus Ananthakrishnan 1976. Distribution: India (Karnataka).

Dixothrips Ananthakrishnan 1969

Dixothrips onerosus Ananthakrishnan 1969. Distribution: India (Andhra Pradesh, Karnataka, Kerala).

Dolicholepta Priesner 1932

Dolicholepta flaviantennatus (Seshadri & Ananthakrishnan 1954). Distribution: India (Tamil Nadu).

Dolicholepta inquilinus Ananthakrishnan 1954. Distribution: India (Tamil Nadu).

Dolichothrips Karny 1912

Dolichothrips assimilis Priesner & Seshadri 1952. Distribution: India (Tamil Nadu).

Dolichothrips citripes (Bagnall 1921). Distribution: India (Bihar, Chandigarh, Delhi, Karnataka, Meghalaya, Odisha, West Bengal).

Dolichothrips confusus Ananthakrishnan 1968. Distribution: India (Tamil Nadu).

Dolichothrips fumipennis (Bagnall, 1921).
Distribution: India (West Bengal).

Dolichothrips indicus (Hood 1919).
Distribution: India (Delhi*, Karnataka, Kerala, Meghalaya, Tamil Nadu, West Bengal)

Dolichothrips malhavii Ananthakrishnan 1961. Distribution: India (Uttar Pradesh, West Bengal).

Dolichothrips montanus Ananthakrishnan 1964. Distribution: India (Tamil Nadu).

Dolichothrips nesius Stannard 1962. Distribution: India (Andaman Island).

Dolichothrips ochripes Karny 1926. Distribution: India (Andhra Pradesh, Tamil Nadu).

Dolichothrips zyziphi (Bagnall 1923). Distribution: India (Bihar).

Dyothrips Kudo 1974

Dyothrips pallescens (Hood, 1919).
Distribution: India (Uttar Pradesh).

Ecacanthothrips Bagnall 1909

Ecacanthothrips tibialis (Ashmead 1905).
Distribution: India (Assam, Karnataka, Kerala, Manipur, Meghalaya, Nagaland, Tripura, Tamil Nadu, Tripura, West Bengal).

Eothrips Hood 1915

Eothrips coimbatorensis Ramakrishna 1928.
Distribution: India (Rajasthan, Tamil Nadu).

Eothrips crassicornis (Karny 1912).
Distribution: India (Andhra Pradesh).

Eothrips distinctus Ananthakrishnan 1967.
Distribution: India (Madhya Pradesh).

Eothrips sirumalaiensis Ananthakrishnan 1968. Distribution: India (Tamil Nadu).

Eugynothrips Priesner 1926

Eugynothrips priesneri Ramakrishna 1928.
Distribution: India (Tamil Nadu).

Euoplothrips Hood 1918

Euoplothrips malabaricus Ramakrishna & Margabandhu 1931. Distribution: India (Tamil Nadu, West Bengal).

Euryaplothrips Ramakrishna & Margabandhu 1931

Euryaplothrips crassus Ramakrishna & Margabandhu 1931. Distribution: India (Tamil Nadu).

Eurhynchothrips Ramakrishna & Margabandhu 1931

Eurhynchothrips ordinarius (Hood 1919).
Distribution: India (Kerala, Tamil Nadu).

Gigantothrips Zimmermann 1900

Gigantothrips elegans Zimmermann 1900.
Distribution: India (Bihar, Delhi, Karnataka, Mizoram, Odisha, Punjab, Tamil Nadu).

Gigantothrips gardneri Ananthakrishnan 1960. Distribution: India (Uttarakhand).

Gigantothrips halidayi (Newman 1856).
Distribution: India (Karnataka).

Gigantothrips ochroscelis Priesner 1952.
Distribution: India (Tamil Nadu).

Gigantothrips nigrodentatus (Karny 1913).
Distribution: India (Karnataka).

Gigantothrips seshadrui (Ananthakrishnan 1964). Distribution: India (Kerala).

Gigantothrips tibialis Bagnall 1921.
Distribution: India (Andaman Island, Karnataka, Kerala, Uttarakhand).

Glubothrips Ananthakrishnan 1969

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Glubothrips mucidus Ananthakrishnan 1969. Distribution: India (Kerala, Tamil Nadu).

Gynaikothrips Zimmermann 1900

Gynaikothrips affinis Muraleedharan & Sen 1981. Distribution: India (Tripura).

Gynaikothrips bengalensis Ananthakrishnan 1973. Distribution: India (Karnataka, Manipur, Nagaland, Tripura, West Bengal).

Gynaikothrips cecidii Ananthakrishnan 1968. Distribution: India (Madhya Pradesh).

Gynaikothrips flaviantennatus Moulton 1929. Distribution: India (Odisha).

Gynaikothrips gardneri (Moulton 1933). Distribution: India.

Gynaikothrips imitator Ananthakrishnan 1968. Distribution: India (Tamil Nadu).

Gynaikothrips malabaricus Ramakrishna 1928. Distribution: India (Kerala, West Bengal).

Gynaikothrips microchaetus Ananthakrishnan & Jagadish 1969. Distribution: India (Karnataka).

Gynaikothrips rossi Sen 1980. Distribution: India (Andaman Island).

Gynaikothrips schefflericola Ananthakrishnan & Viswanath 1975. Distribution: India (Karnataka).

Gynaikothrips uzeli (Zimmermann 1900). Distribution: India (Assam, Karnataka, Odisha, Tamil Nadu, West Bengal).

Habrothrips Ananthakrishnan 1968

Habrothrips curiosus Ananthakrishnan 1968. Distribution: India (Tamil Nadu).

Haplothrips (*Haplothrips*) Amyot & Serville 1843

Haplothrips (*Haplothrips*) *andresi* Priesner 1931. Distribution: India (Tamil Nadu).

Haplothrips (*Haplothrips*) *bagrolis* Bhatti 1973. Distribution: India (Himachal Pradesh).

Haplothrips (*Haplothrips*) *bicolor* (Ananthakrishnan 1964). Distribution: India (Andhra Pradesh, Tamil Nadu).

Haplothrips (*Haplothrips*) *ceylonicus* Schmutz 1913. Distribution: India (Meghalaya, Tamil Nadu, West Bengal).

Haplothrips (*Haplothrips*) *fungulus* (Ananthakrishnan 1973). Distribution: India (Andhra Pradesh, Kerala, Meghalaya, Tamil Nadu, Tripura, Uttar Pradesh).

Haplothrips (*Haplothrips*) *ganglbaueri* Schmutz 1913. Distribution: India (Andaman Island, Andhra Pradesh, Delhi, Haryana, Karnataka, Madhya Pradesh, Meghalaya, Punjab, Rajasthan, Sikkim, Tamil Nadu, Tripura, Uttar Pradesh, West Bengal), .

Haplothrips (*Haplothrips*) *gowdeyi* (Franklin 1908). Distribution: India (Andaman Island, Meghalaya, Punjab, Rajasthan, Tamil Nadu, Tripura, Uttar Pradesh*, West Bengal).

Haplothrips (*Haplothrips*) *hrasvamukha* (Ramakrishna 1928). Distribution: India (Kerala).

Haplothrips (*Haplothrips*) *longisetosus* Ananthakrishnan 1955. Distribution: India (Kerala, Uttar Pradesh).

Haplothrips (*Haplothrips*) *mangiferae* Priesner 1930. Distribution: India (Delhi, Haryana, Himachal Pradesh).

Haplothrips (*Haplothrips*) *montanus* (Ananthakrishnan & Jagadish 1970). Distribution: India (West Bengal).

Haplothrips (*Haplothrips*) *pirus* Bhatti 1967. Distribution: India (Delhi).

Haplothrips (*Haplothrips*) *reuteri* (Karny 1907). Distribution: India (Uttarakhand).

Haplothrips (*Haplothrips*) *tenuipennis* Bagnall 1918. Distribution: India (Andaman Island, Assam, Madhya Pradesh, Maharashtra, Rajasthan, Tamil Nadu, West Bengal).

Haplothrips (*Haplothrips*) *trivandrensis* (Ananthakrishnan 1965). Distribution: India (Kerala).

Haplothrips (*Haplothrips*) *verbasci* (Osborn 1897). Distribution: India (Tamil Nadu).

***Haplothrips* (*Trybomiella*) Bagnall 1926**

Haplothrips (*Trybomiella*) *articulosus* (Bagnall 1926). Distribution: India (Andhra Pradesh, Meghalaya, West Bengal).

Haplothrips (*Trybomiella*) *bagnalli* (Trybom 1910). Distribution: India (Tamil Nadu).

Haplothrips (*Trybomiella*) *clarisetis* Priesner 1930. Distribution: India (Delhi, Gujarat, Haryana, Maharashtra, Tamil Nadu, Uttar Pradesh, West Bengal).

Haplothrips (*Trybomiella*) *nigricornis* (Bagnall 1910). Distribution: India (Tamil Nadu).

Haplothrips (*Trybomiella*) *talpa* Priesner 1931. Distribution: India (Andhra Pradesh).

Haplothrips (*Trybomiella*) *tirumalraoi* Ramakrishna & Margabandhu 1931. Distribution: India.

***Holothrips* Karny 1911**

Holothrips *andamanensis* (Sen 1980). Distribution: India (Andaman Island).

Holothrips *ananthakrishnani* Okajima 1976. Distribution: India (Tamil Nadu, Tripura).

Holothrips *cracens* (Ananthakrishnan 1968). Distribution: India (Andhra Pradesh, Kerala, Tamil Nadu).

Holothrips *fumidus* (Ananthakrishnan 1972). Distribution: India (Uttar Pradesh, West Bengal).

Holothrips *indicus* Ananthakrishnan 1956. Distribution: India (Andhra Pradesh, Kerala, Tamil Nadu).

Holothrips *minor* (Hood 1937). Distribution: India: (Kerala, Tamil Nadu, Tripura).

Holothrips *mirandus* (Ananthakrishnan 1969). Distribution: India (Tamil Nadu).

Holothrips *nepalensis* (Pelikán 1970). Distribution: India (West Bengal).

Holothrips *quadrissetis* Okajima 1976. Distribution: India (West Bengal).

Holothrips *ruidus* (Ananthakrishnan 1969). Distribution: India (Tamil Nadu).

Holothrips *stannardi* (Ananthakrishnan 1972). Distribution: India (Uttar Pradesh).

Holothrips *subtilis* (Ananthakrishnan 1972). Distribution: India (Tamil Nadu).

Holothrips *typicus* (Ananthakrishnan 1967). Distribution: India (Tamil Nadu).

***Hoplandrothrips* Hood 1912**

Hoplandrothrips *corticis* Ananthakrishnan 1972. Distribution: India (Uttar Pradesh).

Hoplandrothrips *flavipes* Bagnall 1923. Distribution: India (Karnataka, Kerala, Manipur, Meghalaya, Tamil Nadu, Tripura, West Bengal).

Hoplandrothrips *kudoii* Muraleedharan 1982. Distribution: India (Manipur).

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Hoplandrothrips nobilis Priesner 1939.
Distribution: India (Delhi*, Kerala, Tamil Nadu, West Bengal).

Hoplothrips Amyot & Serville 1843

Hoplothrips angusticeps (Bagnall 1910).
Distribution: India (Kerala).

Hoplothrips fungosus Moulton 1928.
Distribution: India (Karnataka, Tamil Nadu, West Bengal).

Hoplothrips nemorius Ananthakrishnan 1971. Distribution: India (Karnataka, Kerala, Tamil Nadu).

Hoplothrips orientalis (Ananthakrishnan 1969). Distribution: India (Andhra Pradesh, Tamil Nadu).

Hoplothrips transvaalensis (Hood 1924).
Distribution: India (Andhra Pradesh, Tamil Nadu).

Idiothrips Faure 1933

Idiothrips bellus Faure 1933. Distribution: India (Delhi, Madhya Pradesh, Maharashtra, Rajasthan).

Karnyothrips Watson 1923

Karnyothrips alpha Pitkin 1976.
Distribution: India (Kerala, Tamil Nadu, West Bengal).

Karnyothrips flavipes (Jones 1912).
Distribution: India (Andhra Pradesh, Delhi, Karnataka, Kerala, Meghalaya, Tamil Nadu, Uttar Pradesh).

Karnyothrips melaleucus (Bagnall 1911).
Distribution: India (Andaman Island, Assam, Karnataka, Kerala, Meghalaya, Tamil Nadu, West Bengal).

Karnyothrips mucidus (Ananthakrishnan & Jagadish 1971). Distribution: India (Kerala, West Bengal).

Karnyothrips nigriflavus Ramakrishna 1934.
Distribution: India (Kerala, Tamil Nadu).

Kochummania Ananthakrishnan 1969

Kochummania excelsa Ananthakrishnan 1969. Distribution: India (Kerala).

Leeuwenia Karny 1912

Leeuwenia coriacea (Bagnall 1912).
Distribution: India (Uttarakhand).

Leeuwenia eugeniae Bagnall 1924.
Distribution: India (Tamil Nadu).

Leeuwenia karnyiana Priesner 1929.
Distribution: India (Assam, Karnataka, Meghalaya, Tamil Nadu, West Bengal).

Leeuwenia maculans Priesner & Seshadri 1953. Distribution: India (Tamil Nadu).

Leeuwenia vorax Ananthakrishnan 1969.
Distribution: India (Kerala).

Liophlaeothrips Priesner 1919

Liophlaeothrips ablusus Ananthakrishnan 1971. Distribution: India (Kerala).

Liophlaeothrips acaciae Tyagi & Kumar 2011. Distribution: India (Karnataka).

Liophlaeothrips amoenus Ananthakrishnan 1966. Distribution: India (Assam, Maharashtra).

Liophlaeothrips cecidii Ananthakrishnan 1964. Distribution: India (Tamil Nadu).

Liophlaeothrips curtus Ananthakrishnan & Jagadish 1969. Distribution: India (Andhra Pradesh).

Liophlaeothrips dentipes (Seshadri & Ananthakrishnan 1954). Distribution: India (Kerala).

Liophlaeothrips nitidus Ananthakrishnan 1968. Distribution: India (Andhra Pradesh).

Liophlaeothrips pavettae Ananthakrishnan & Jagadish 1969. Distribution: India (Andhra Pradesh).

Liophlaeothrips pictus Ananthakrishnan 1968. Distribution: India (Andhra Pradesh, Kerala, Tamil Nadu).

Liophlaeothrips reperticus Ananthakrishnan & Muraleedharan 1974. Distribution: India (Tamil Nadu).

Liophlaeothrips segnis Ananthakrishnan & Jagadish 1969. Distribution: India (Londa).

Liophlaeothrips succinctus Ananthakrishnan & Jagadish 1969. Distribution: India (Kerala).

Liophlaeothrips vichitravarna (Ramakrishna 1928). Distribution: India (Karnataka, Tamil Nadu).

Liothrips (Liothrips) Uzel 1895

Liothrips (Liothrips) aberrans Muraleedharan & Sen 1978. Distribution: India (Sikkim, West Bengal).

Liothrips (Liothrips) abstrusus Ananthakrishnan & Muraleedharan 1974. Distribution: India (Karnataka).

Liothrips (Liothrips) aequilus Ananthakrishnan & Jagadish 1969. Distribution: India (Andhra Pradesh).

Liothrips (Liothrips) ananthakrishnani Sen 1976. Distribution: India (Arunachal Pradesh).

Liothrips (Liothrips) associatus Ananthakrishnan & Jagadish 1969. Distribution: India (Tamil Nadu).

Liothrips (Liothrips) ater Ananthakrishnan & Jagadish 1969. Distribution: India (Kerala).

Liothrips (Liothrips) bireni Nilamani & Prasad, 1991. Distribution: India (Manipur).

Liothrips (Liothrips) bosei Moulton 1928. Distribution: India (Uttarakhand).

Liothrips (Liothrips) bournieri Muraleedharan & Sen 1981. Distribution: India (Tripura).

Liothrips (Liothrips) cecidii Ananthakrishnan & Jagadish 1969. Distribution: India (Kerala).

Liothrips (Liothrips) champakae (Ramakrishna & Margabandhu, 1939). Distribution: India (West Bengal).

Liothrips (Liothrips) chavicae (Zimmermann 1900). Distribution: India (Kerala).

Liothrips (Liothrips) clarus Muraleedharan & Sen 1981. Distribution: India (Tripura).

Liothrips (Liothrips) digressus Ananthakrishnan 1972. Distribution: India (Andhra Pradesh).

Liothrips (Liothrips) emulatus Ananthakrishnan 1976. Distribution: India (Tamil Nadu).

Liothrips (Liothrips) epacrus Ananthakrishnan & Muraleedharan 1974. Distribution: India (Madhya Pradesh).

Liothrips (Liothrips) exilis (Ananthakrishnan & Jagadish 1969). Distribution: India (Goa).

Liothrips (Liothrips) flavescens Ananthakrishnan & Jagadish 1969. Distribution: India (Kerala).

Liothrips (Liothrips) flavitibia Moulton 1933. Distribution: India (West Bengal).

Liothrips (Liothrips) fragilis Ananthakrishnan 1976. Distribution: India (Tamil Nadu).

Liothrips (Liothrips) furvus Ananthakrishnan & Jagadish 1969. Distribution: India (Kerala).

Liothrips (Liothrips) himalayanus Ananthakrishnan & Jagadish 1970.

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Distribution: India (Meghalaya, West Bengal).

Liothrips (*Liothrips*) *infrequens*
Muraleedharan & Sen 1981. Distribution: India (Tripura).

Liothrips (*Liothrips*) *indicus*
Ananthakrishnan 1972. Distribution: India (Maharashtra).

Liothrips (*Liothrips*) *inquilinus*
Ananthakrishnan & Jagadish 1967. Distribution: India (Madhya Pradesh).

Liothrips (*Liothrips*) *infrequens*
Muraleedharan & Sen 1981. Distribution: India (Tripura).

Liothrips (*Liothrips*) *interlocatus* (Karny 1927). Distribution: India (Kerala).

Liothrips (*Liothrips*) *jogensis*
Ananthakrishnan & Jagadish 1967. Distribution: India (Karnataka).

Liothrips (*Liothrips*) *kannani* (Moulton 1929). Distribution: India.

Liothrips (*Liothrips*) *kolliensis*
Ananthakrishnan 1972. Distribution: India (Tamil Nadu).

Liothrips (*Liothrips*) *litsaeae* Moulton 1933. Distribution: India.

Liothrips (*Liothrips*) *malabaricus*
Ananthakrishnan & Jagadish 1967. Distribution: India (Tamil Nadu).

Liothrips (*Liothrips*) *minys*
Ananthakrishnan 1972. Distribution: India (Tamil Nadu).

Liothrips (*Liothrips*) *monae* Nilamani & Prasad 1990. Distribution: India (Manipur).

Liothrips (*Liothrips*) *mohanrami* Bhatti, Varatharajan and Singh 2006. Distribution: India (Nagaland).

Liothrips (*Liothrips*) *morindae*
Ananthakrishnan & Muraleedharan 1974.

Distribution: India (Tamil Nadu).

Liothrips (*Liothrips*) *morulus*
Ananthakrishnan & Jagadish 1970.

Distribution: India (West Bengal).

Liothrips (*Liothrips*) *moultoni* (Ramakrishna 1928). Distribution: India (Tamil Nadu).

Liothrips (*Liothrips*) *mucronis*
Ananthakrishnan & Jagadish 1967.

Distribution: India (Karnataka).

Liothrips (*Liothrips*) *muralii* Sen 1982. Distribution: India (Kerala).

Liothrips (*Liothrips*) *nanus*
Ananthakrishnan 1972. Distribution: India (Tamil Nadu).

Liothrips (*Liothrips*) *nubilis*
Ananthakrishnan & Jagadish 1969. Distribution: India (Kerala).

Liothrips (*Liothrips*) *pallicrus* (Karny 1923). Distribution: India (Tamil Nadu).

Liothrips (*Liothrips*) *pallipes* (Karny 1913). Distribution: India (Kerala)

Liothrips (*Liothrips*) *perandaphaga* (Ramakrishna, 1928). Distribution: India (Tamil Nadu).

Liothrips (*Liothrips*) *ramakrishnae*
Ananthakrishnan & Jagadish 1969. Distribution: India (Tamil Nadu).

Liothrips (*Liothrips*) *raoensis* (Ramakrishna, 1928). Distribution: India (Tamil Nadu).

Liothrips (*Liothrips*) *renukae* Muraleedharan & Sen 1981. Distribution: India (Himachal Pradesh).

Liothrips (*Liothrips*) *retusus*
Ananthakrishnan 1976. Distribution: India (Karnataka).

Liothrips (*Liothrips*) *sangali* Kulshrestha & Vijay Veer 1990. Distribution: India (Uttarakhand).

Liothrips (*Liothrips*) *seshadrii*
Ananthakrishnan & Muraleedharan 1974.
Distribution: India (Tamil Nadu).

Liothrips (*Liothrips*) *setinodis* (Reuter 1880).
Distribution: India (Tamil Nadu).

Liothrips (*Liothrips*) *tersus*
Ananthakrishnan & Jagadish 1967.
Distribution: India (Karnataka).

Liothrips (*Liothrips*) *tibialis* Priesner 1952.
Distribution: India (Tamil Nadu).

Liothrips (*Liothrips*) *variabilis*
Ananthakrishnan & Jagadish 1967.
Distribution: India (Tamil Nadu).

Liothrips (*Liothrips*) *wangjinensis* Nilamani
& Prasad 1991. Distribution: India
(Manipur).

Liothrips (*Zopyrothrips*) Priesner 1968
Liothrips (*Zopyrothrips*) *fumipennis* (Karny
1913). Distribution: India.

Liothrips (*Zopyrothrips*) *sordidus*
Ananthakrishnan 1972. Distribution: India
(Tamil Nadu).

Liothrips (*Zopyrothrips*) *spectabilis*
Ananthakrishnan 1972. Distribution: India
(Meghalaya, Tamil Nadu).

Liothrips (*Zopyrothrips*) *viticola* (Karny
1913). Distribution: India (Kerala).

Lygothrips Ananthakrishnan 1964
Lygothrips *jambuvasi* (Ramakrishna 1928).
Distribution: India (Andhra Pradesh,
Karnataka, Madhya Pradesh, Tamil
Nadu).

Macrophthalthmothrips Karny 1922
Macrophthalthmothrips *splendidus*
Ananthakrishnan 1968. Distribution: India
(Karnataka, Tamil Nadu).

Malacothrips Hinds 1902
Malacothrips *natalensis* (Trybom 1912).
Distribution: India (Uttarakhand).

Mallothrips Ramakrishna 1928
Mallothrips *indica* Ramakrishna 1928.
Distribution: India (Andhra Pradesh,
Delhi, Karnataka, Kerala*, Tamil Nadu).

Margaritothrips Priesner 1932
Margaritothrips *flavus* Bhatti 1965.
Distribution: India (Madhya Pradesh).
Margaritothrips *longus* Bhatti 1967.
Distribution: India (Delhi).
Margaritothrips *sumatrensis* Priesner 1932.
Distribution: India (Kerala).

Maxillithrips Bhatti 1978
Maxillithrips *arorai* (Bhatti & Hattar 1974).
Distribution: India (Haryana).

Mesicothrips Priesner 1952
Mesicothrips *inquilinus* Ananthakrishnan
1967. Distribution: India (Tamil Nadu).
Mesicothrips *plicans* Priesner 1952.
Distribution: India (Tamil Nadu).

Mesothrips Zimmermann 1900
Mesothrips *acutus* Muraleedharan & Sen
1981. Distribution: India (Tripura).
Mesothrips *ambasensis* Muraleedharan &
Sen 1981. Distribution: India (Tripura).
Mesothrips *apatelus* Karny 1927.
Distribution: India (Karnataka).
Mesothrips *bhimabahu* Ramakrishna 1928.
Distribution: India (Karnataka).
Mesothrips *cracens* Ananthakrishnan 1968.
Distribution: India (Karnataka).

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Mesothrips extensivus Ananthakrishnan & Jagadish 1969. Distribution: India (Assam, Kerala, Meghalaya, Tamil Nadu).

Mesothrips jordani Zimmermann 1900. Distribution: India (Andaman Island, Karnataka, Tamil Nadu, Tripura, West Bengal).

Mesothrips latus Muraleedharan & Sen 1981. Distribution: India (Tripura).

Mesothrips lividicornis (Karny 1923). Distribution: India (Tripura).

Mesothrips malloti Moulton 1929. Distribution: India (Uttarakhand).

Mesothrips manii Ananthakrishnan 1972. Distribution: India (Tamil Nadu).

Mesothrips melinocnemis Karny 1927. Distribution: India (Tamil Nadu).

Mesothrips perlucidus Muraleedharan & Sen 1981. Distribution: India (Tripura).

Mimothrips Priesner 1949

Mimothrips orientalis Ananthakrishnan 1966. Distribution: India (Tamil Nadu).

Mutothrips Ananthakrishnan & Swaminathan 1980

Mutothrips validus Ananthakrishnan & Swaminathan 1980. Distribution: India (Karnataka).

Mystrothrips Priesner 1949

Mystrothrips dammermani (Priesner 1933). Distribution: India (Karnataka, Tamil Nadu).

Neodixothrips Sen & Muraleedharan 1976

Neodixothrips assamensis Sen & Muraleedharan 1976. Distribution: India (Assam).

Neothrips Hood 1908

Neothrips lepidus Ananthakrishnan 1971. Distribution: India (Kerala).

Ocnothrips Ananthakrishnan 1969

Ocnothrips indicus Ananthakrishnan 1969. Distribution: India (Kerala).

Ocythrips Ananthakrishnan 1972

Ocythrips rarus Ananthakrishnan 1972. Distribution: India (West Bengal).

Oidanothrips Moulton 1944

Oidanothrips enormis (Ananthakrishnan, 1969). Distribution: India (Andhra Pradesh, Tamil Nadu).

Oidanothrips megacephalus (Ananthakrishnan, 1969). Distribution: India (West Bengal).

Opidnothrips Ananthakrishnan 1971

Opidnothrips corticulus Ananthakrishnan 1971. Distribution: India (Kerala).

Paramystrothrips Bournier 1971

Paramystrothrips moundi Bhatti 1995. Distribution: India (Delhi).

Pegothrips Sen & Muraleedharan 1976

Pegothrips meghalaya Sen & Muraleedharan 1976. Distribution: India (Meghalaya, Uttar Pradesh, West Bengal).

Phenicothrips Bhatti 1995

Phenicothrips eugeniae (Priesner 1930). Distribution: India (Karnataka, Kerala).

Phenicothrips gracilis (Karny 1913). Distribution: India (Kerala, Tamil Nadu).

Phenothrips Ananthakrishnan 1967

Phenothrips decoratus Ananthakrishnan 1967. Distribution: India (Kerala).

Phiarothrips Ananthakrishnan 1968

Phiarothrips reperticus Ananthakrishnan, 1968. Distribution: India (Kerala).

Phlaeothrips Haliday 1836

Phlaeothrips anacardii (Newman 1856). Distribution: India (Karnataka).

Phlaeothrips nilgiricus Ananthakrishnan 1968. Distribution: India (Tamil Nadu).

Phorinothrips Ananthakrishnan 1968

Phorinothrips levis Ananthakrishnan & Varadarasan 1978. Distribution: India (Kerala).

Phorinothrips loranathi Ananthakrishnan 1968. Distribution: India (Karnataka).

Phorinothrips minusculus Ananthakrishnan 1971. Distribution: India (Kerala).

Phylladothrips Priesner 1933

Phylladothrips karnyi Priesner, 1933. Distribution: India (Karnataka).

Plectrothrips Hood 1908

Plectrothrips corticinus Priesner 1935. Distribution: India (Tamil Nadu).

Plectrothrips eximius Ananthakrishnan, 1969. Distribution: India (Tamil Nadu).

Plectrothrips pallipes Hood, 1916. Distribution: India (Kerala).

Plicothrips Bhatti 1979

Plicothrips apicalis (Bagnall 1915). Distribution: India (Delhi, Gujarat, Karnataka*, Maharashtra, Punjab, Tamil Nadu, Uttar Pradesh, West Bengal).

Pnigmothrips Priesner 1953

Pnigmothrips medanensis Priesner 1953. Distribution: India (Tamil Nadu).

Podothrips Hood 1913

Podothrips bicolor Seshadri & Ananthakrishnan 1954. Distribution: India (Andaman Island, Tamil Nadu, West Bengal).

Podothrips canizoi Bhatti 1978. Distribution: India (Delhi, Punjab).

Podothrips distinctus Ananthakrishnan 1965. Distribution: India (Tamil Nadu).

Podothrips graminum Priesner 1938. Distribution: India.

Podothrips lucasseni (Kruger 1890). Distribution: India (Andhra Pradesh, Tamil Nadu, Tripura, West Bengal).

Podothrips moultoni Ananthakrishnan 1965. Distribution: India (Andhra Pradesh).

Podothrips odonaspicola (Kurosawa). Distribution: India (Andaman Island).

Podothrips placitus Ananthakrishnan 1966. Distribution: India (Tamil Nadu).

Podothrips scitulus Ananthakrishnan 1967. Distribution: India (Tamil Nadu).

Podothrips semiflavus Hood 1913. Distribution: India (Punjab).

Praepodothrips Priesner & Seshadri 1952

Praepodothrips cymbapogoni Ananthakrishnan 1956. Distribution: India (Tamil Nadu).

Praepodothrips indicus Priesner & Seshadri 1952. Distribution: India (Tamil Nadu).

Praepodothrips nigrocephalus Ananthakrishnan 1964. Distribution: India (Tamil Nadu).

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Praepodothrips priesneri Ananthakrishnan 1955. Distribution: India (Andaman Island, Tamil Nadu).

Psalidothrips Priesner 1932

Psalidothrips ascitus (Ananthakrishnan 1969). Distribution: India (Karnataka).

Psephenothrips Reyes 1994

Psephenothrips moundi Tyagi & Kumar 2012. Distribution: India (Karnataka).

Psephenothrips machili (Moulton 1928). Distribution: India (Kerala).

Psenothrips Ananthakrishnan 1967

Psenothrips priesneri (Ananthakrishnan 1964). Distribution: India (Tamil Nadu).

Pygmaeothrips Karny 1920

Pygmaeothrips angusticeps (Hood 1908). Distribution: India (Karnataka, Kerala, Tamil Nadu).

Pyknothrips Ananthakrishnan 1964

Pyknothrips reticulatus Ananthakrishnan 1964. Distribution: India (Andhra Pradesh).

Ramakrishniella Karny 1927

Ramakrishniella nirmalapaksha Ramakrishna, 1928. Distribution: India (Tamil Nadu).

Ramakrishniella unispina Karny 1927. Distribution: India (Tamil Nadu).

Sakimurella Bhatti 1999

Sakimurella kiriti (Ramakrishna 1928). Distribution: India (Kerala, Tamil Nadu).

Salothrips Ananthakrishnan 1976

Salothrips indicus Ananthakrishnan 1976. Distribution: India (Andhra Pradesh).

Scelothrips Priesner 1952

Scelothrips menoni (Ananthakrishnan 1950). Distribution: India (Tamil Nadu).

Schedothrips Ananthakrishnan 1969

Schedothrips orientalis (Ananthakrishnan 1968). Distribution: India (Tamil Nadu).

Schedothrips tumidus Ananthakrishnan 1969. Distribution: India (Andhra Pradesh).

Socothrips Ananthakrishnan 1972

Socothrips verrucosus Ananthakrishnan 1972. Distribution: India (Andhra Pradesh, Tamil Nadu).

Sophiothrips Hood 1934

Sophiothrips nigrus Ananthakrishnan 1971. Distribution: India (West Bengal).

Sophiothrips typicus (Ananthakrishnan 1964). Distribution: India: (Andhra Pradesh, Tamil Nadu).

Sphingothrips Ananthakrishnan 1972

Sphingothrips trachypogon (Karny 1923). Distribution: India (Andhra Pradesh).

Stannardiana Ananthakrishnan 1964

Stannardiana variegata Ananthakrishnan 1964. Distribution: India (Andhra Pradesh, Karnataka, Tamil Nadu).

Stannardothrips Ananthakrishnan 1965

Stannardothrips longirostris Ananthakrishnan 1965. Distribution: India (Andhra Pradesh).

Stephanothrips Trybom 1913

Stephanothrips adnatus Ananthakrishnan 1972. Distribution: India (Uttar Pradesh).

Stephanothrips occidentalis Hood & Williams 1925. Distribution: India (Andhra Pradesh, Kerala, Manipur, Tamil Nadu, Tripura, West Bengal).

Stictothrips Hood 1925

Stictothrips fimbriata (Ananthakrishnan 1953). Distribution: India (Tamil Nadu).

Stictothrips faurei Hood 1925. Distribution: India (Delhi, Tamil Nadu).

Strepterothrips Hood 1934

Strepterothrips orientalis Ananthakrishnan 1964. Distribution: India (Tamil Nadu).

Synergothrips Ananthakrishnan 1972

Synergothrips prolatus Ananthakrishnan 1972. Distribution: India (Andhra Pradesh).

Symphyothrips Hood & Williams 1915

Symphyothrips aberrans Ananthakrishnan 1971. Distribution: India (Andhra Pradesh, Tamil Nadu).

Tamilthrips Bhatti 1995

Tamilthrips pini (Ananthakrishnan 1961). Distribution: India (Tamil Nadu).

Tetradothrips Priesner 1952

Tetradothrips foliiperda (Karny 1926). Distribution: India (Karnataka, Tamil Nadu).

Teuchothrips Hood 1919

Teuchothrips eugeniae Seshadri & Ananthakrishnan 1954. Distribution: India (Tamil Nadu).

Teuchothrips longus (Schmütz 1913). Distribution: India (Karnataka, Tamil Nadu).

Thilakothrips Ramakrishna 1928

Thilakothrips babuli Ramakrishna 1928. Distribution: India (Andhra Pradesh, Delhi, Karnataka, Madhya Pradesh, Tamil Nadu).

Thlibothrips Priesner, 1952

Thlibothrips manipurensis Muraleedharan 1982. Distribution: India (Manipur).

Treherniella Watson 1924

Treherniella inferna (Priesner 1922). Distribution: India (Kerala).

Trichinothrips Bagnall 1929

Trichinothrips breviceps (Bagnall 1926). Distribution: India (Tamil Nadu).

Tylothrips Hood 1937

Tylothrips indicus Sen & Muraleedharan 1976. Distribution: India (Meghalaya).
Tylothrips samirseni Varatharajan, Singh & Bala 2015. Distribution: India (Manipur).

Urothrips Bagnall 1909

Urothrips tarai (Stannard 1970). Distribution: India (Uttar Pradesh).

Veerabahuthrips Ramakrishna 1932

Veerabahuthrips bambusae Ramakrishna 1932. Distribution: India (Tamil Nadu).

Xylaplothrips Priesner 1925

Xylaplothrips debilis Ananthakrishnan & Jagadish 1971. Distribution: India (Andhra Pradesh, Arunachal Pradesh, Delhi*, Kerala, West Bengal).

Xylaplothrips emineus Ananthakrishnan & Jagadish 1971. Distribution: India (Kerala).
Xylaplothrips flavitibia Ananthakrishnan & Jagadish 1969. Distribution: India (Chandigarh, Delhi, Madhya Pradesh, Tamil Nadu, Uttar Pradesh).
Xylaplothrips flavus Ananthakrishnan 1964. Distribution: India (Tamil Nadu).
Xylaplothrips inquilinus (Priesner 1921). Distribution: India (Andhra Pradesh, Kerala, Tamil Nadu, West Bengal).
Xylaplothrips ligis Ananthakrishnan & Jagadish 1971. Distribution: India (Andhra Pradesh, Delhi, Karnataka).
Xylaplothrips micans Ananthakrishnan & Jagadish 1971. Distribution: India (Kerala, Tamil Nadu).
Xylaplothrips montanus (Ananthakrishnan & Jagadish 1970). Distribution: India (West Bengal).
Xylaplothrips pictipes (Bagnall, 1919). Distribution: India (Andaman Island, Karnataka, Kerala, West Bengal).
Xylaplothrips pusillus Ananthakrishnan & Jagadish 1969. Distribution: India (Andhra Pradesh, Assam, Kerala, Manipur, West Bengal).
Xylaplothrips tener Ananthakrishnan & Jagadish 1969. Distribution: India (Goa-Londa broader).

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A review of the ant genus *Harpegnathos* Jerdon, 1851 (Hymenoptera: Formicidae) in the Philippines, with the description of two new species

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Abstract

Harpegnathos honestoi and *H. alperti* are described from Mt. Isarog, Luzon Island, Philippines. They are the fourth and fifth worker-based species of the genus from the Philippines. *Harpegnathos honestoi* is the first species known to be at least sub-arboreal. A key to the Philippine species is provided.

Keywords: *Harpegnathos honestoi*, *Harpegnathos alperti*, Philippines, dichotomous key, Formicidae, Mt. Isarog, new species.

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Introduction

Harpegnathos Jerdon, 1851 is a genus of unmistakably distinctive ponerine ants. These large ants bear long curved forceps-like mandibles endowed with more than 50 sharp teeth, huge ovate eyes at the anterolateral corners of the head, a long tubular mesosoma, and long spindly legs that they use effectively to jump. They range from India and Sri Lanka to Southeast Asia.

Three nominal worker-based species and subspecies and one male-based species are known from the Philippines (General and Alpert, 2012). None of these are known to be sympatrically associated, each worker-based species having been found on different islands (see Figure 9): *H. venator chapmani* Donisthorpe, 1937 on Luzon Island, *H. macgregori* Wheeler & Chapman, 1925 on Biliran Island, and *H. empesoi* Chapmani, 1963 on Mindanao Island (Chapman, 1963; Donisthorpe, 1937; Wheeler and Chapman, 1925). Despite the fact that these species are allopatric, I consider them good species because of their clear morphological differences. These morphological differences are summarized in the identification key (see below). The male-based species, *H. medioniger* Donisthorpe, 1942 is known from

Luzon Island (Donisthorpe, 1942). Despite the high species diversity, these ants are rarely encountered in the Philippines. All four species are known only from the holotypes (Chapmani, 1963; Donisthorpe, 1937; Wheeler and Chapman, 1925). With the possible exception of *H. venator chapmani*, none have been encountered again since the original collection for lack of attention (DEMG, unpublished notes).

Materials and Abbreviations

Specimens were examined and measured using a Wild M-5A stereomicroscope with ocular micrometer. Images were created using a Canon 7D digital camera attached to a Leica MZ16 stereomicroscope. Montage images were rendered using Helicon Focus 6. Images were edited with Adobe Photoshop CS6 Extended. Coordinates for historical collections were obtained from the Philippine Gazetteer (DIVA-GIS 2014). Coordinates for the present specimens refer to the base camp to discourage poachers.

The following measurements and indices are reported.

Measurements (in millimeters)

EL	Eye length along the maximum diameter.
EW	Maximum width of compound eye.
HFL	Maximum length of hind femur in anterior view.
HL	Maximum head length in full face (dorsal) view, measured from the anterior-most point of the clypeal margin to the posterior-most point of head capsule.
HW	Maximum head width in full face (dorsal) view, measured behind the eyes.
MandL	Mandible length, the straight line length of the mandible at full closure, measured in the same plane for which the HL measurement is taken (i.e. full face view), from the mandibular apex to the anterior edge of the frontal lobe, or to the transverse line connecting the anterior-most points in those taxa where the margin is concave medially.
ML	Mesosomal length measured from the anterior edge of the pronotum (excluding the collar) to the posterior edge of the propodeal lobe.
MLO	Mandibular outside length, maximum absolute chord length of left mandible measured from lateral insertion to apex, in oblique lateral view so that the entire mandible is in focus
MOW	Median ocellus width, maximum width of median ocellus
MtL	Maximum length of gaster, from base of abdominal tergite IV to apex of abdominal tergite VII, measured in lateral view.
PetH	Petiole height, petiolar height in lateral profile measured as the perpendicular distance from the ventral margin to the highest point of posterolateral tubercles; if ventral margin is concave upward then measured from a line tangent to the uppermost portion of the curve and oriented as close as possible to the long axis of petiole.
PetL	Petiole length, straight line length, in lateral view, from anterior

margin of petiolar denticle to posterior face of petiole

PW Maximum width of pronotum in dorsal view.

SL Length of scape, excluding the basal neck and condyle.

TL The total outstretched length of the ant from the mandibular apex to the gastral apex; when measured in profile the sum of mandibular length + head length + mesosomal length + lengths of waist segments + length of gaster

Indices

CI Cephalic Index: $HW/HL \times 100$.

EI Eye Index: $EL/HW \times 100$.

MI Mandibulo-cephalic Index: $MandL \times 100/HL$

SI Scape index: $SL/HW \times 100$

Repositories

AMNH American Museum of Natural History, New York, NY, USA.

BMNH Natural History Museum, London, UK.

MCZC Museum of Comparative Zoology, Harvard University, Cambridge, MA, USA.

PNM National Museum of the Philippines, Manila, Philippines.

USNM United States National Museum of Natural History, Washington, D.C., USA.

List of species of *Harpegnathos* known from the Philippines

H. alperti sp. n.

H. empesoi Chapman 1963 (examined)

H. honestoi sp. n.

H. macgregori Wheeler & Chapman, 1925 (examined)

H. medioniger Donisthorpe, 1942 (based on the male; not seen)

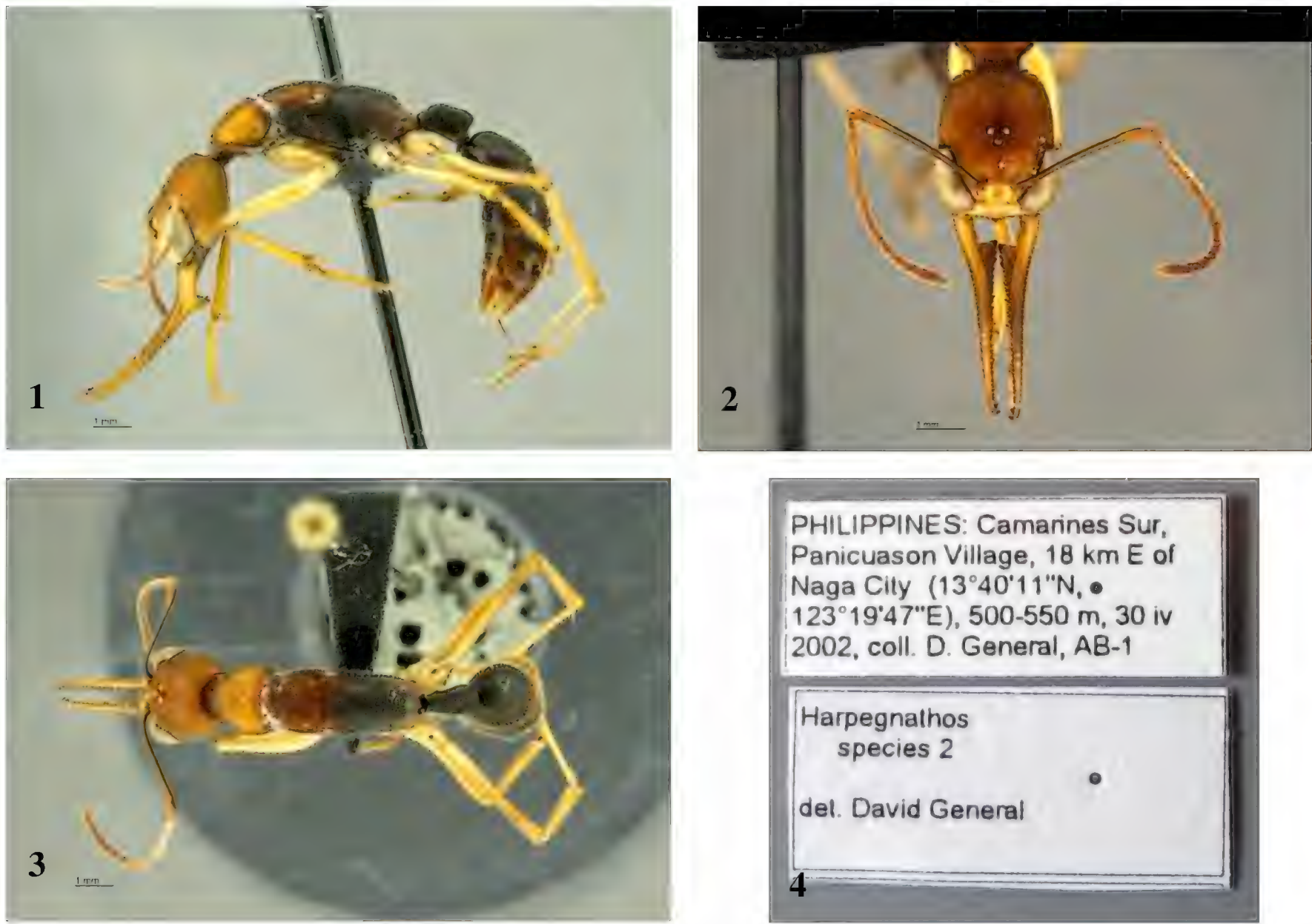
H. venator chapmani Donisthorpe, 1937 (not seen)

Results

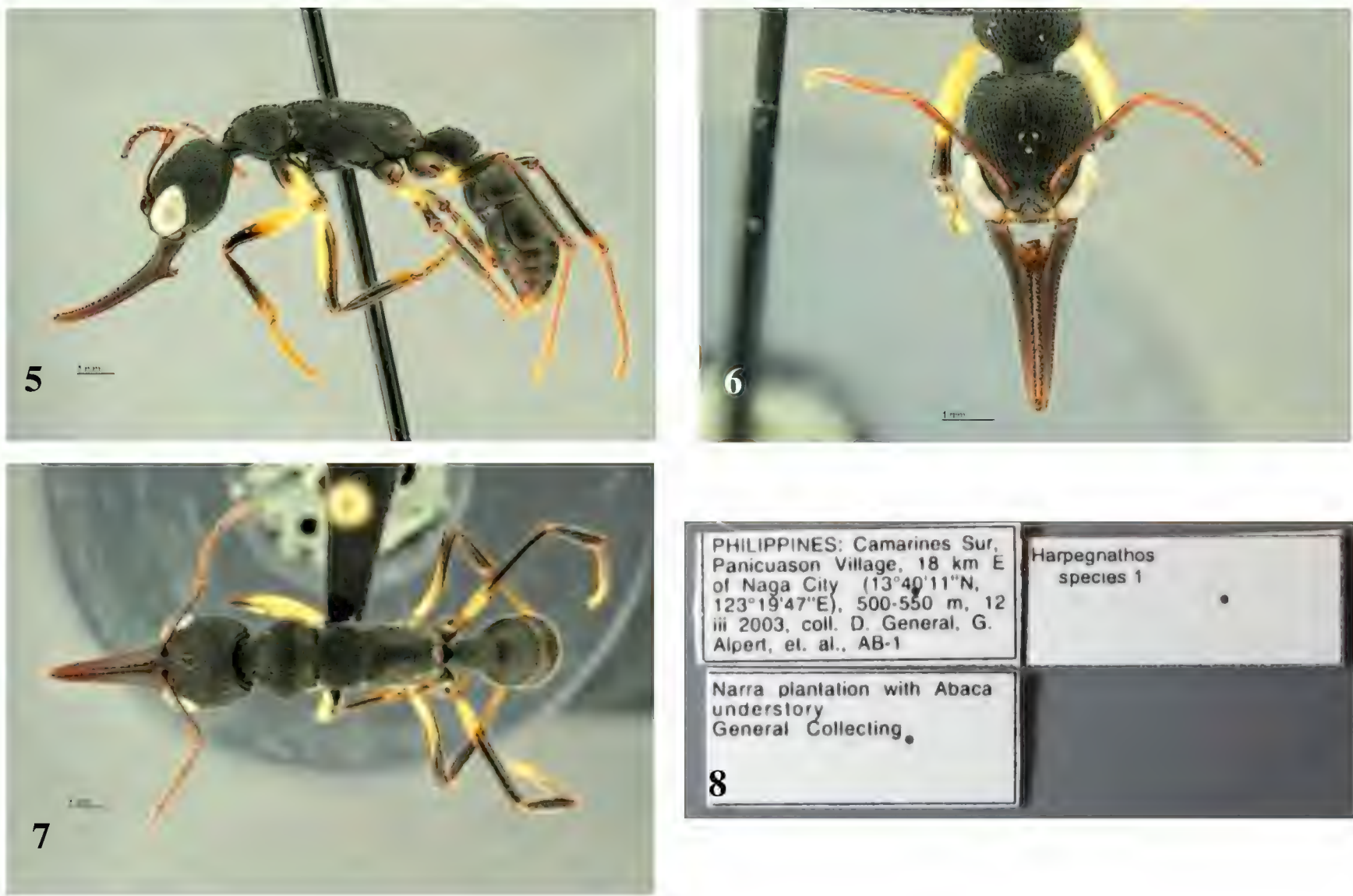
Harpegnathos honestoi General sp. n.

[urn:lsid:zoobank.org:act:DC10CBBE-79B9-4B68-8D14-1EC4952FED20](https://zoobank.org/act:DC10CBBE-79B9-4B68-8D14-1EC4952FED20)

Holotype. PHILIPPINES: Luzon Island, Camarines Sur, Naga City, Panicuason



Figures 1-4. *Harpegnathos honestoi* sp. n., holotype. 1. lateral view, 2. frontal head view, 3. dorsal view, 4. labels.



Figures 5-8. *Harpegnathos alperti* sp. n., holotype. 5. lateral view, 6. frontal head view, 7. dorsal view, 8. labels.

Village, Mt. Isarog, 500-550 m \pm 500 m, 13°40'11" N, 123°19'47" E \pm 4 km, 30.iv.2002, leg. D.E.M. General, (PNM 9021, deposited in PNM).

Type locality: Philippines: Camarines Sur, Naga City, Panicuason Village, Mt. Isarog.

Description of worker (Figs. 1-4)

Holotype measurements: TL 20.44, HL 2.81, HW 2.39, CI 85, SL 2.96, SI 124, MandL 4.11, MI 146, MLO 4.16, PW 1.98, ML 5.15, PetL 1.40, PetH 0.88, HFL 3.64, MtL 4.58, EL 1.35, EW 0.94, EI 57, MOW 0.11.

In full face view, posterior margin of head straight; scape exceeding posterior margin of head by at least width of scape; ocelli present; frontal lobes broad, covering antennal sockets; frontal carinae short, as long as about twice width of scape, diverging; clypeus narrowly inserted between frontal lobes; triangular labral lobe present; eyes extremely large, ovate, occupying anterior lateral margin of head; mandibles converging gradually from attachments; head coarsely striate; antennal scape with sparse, short erect and suberect hairs.

In lateral view, mesosoma long and cylindrical; front coxa well separated from mid- and hindcoxae; front coxa long but distal end not reaching midcoxa; promesonotal suture deeply impressed; metanotal groove obsolete; dorsal face of propodeum very long; propodeal declivity not bounded by lateral carinae; metapleural gland orifice opening laterally, not protected by guard hairs; petiole longer than tall; anterior subpetiolar process triangular; gaster long; sting present and functional; tarsal claws with median tooth.

In dorsal view, irregular striae subparallel on pronotum and mesonotum; propodeum transversely striate; petiole longer than broad; petiole reticulate dorsally and laterally; first and second gastral tergite coarsely punctate over underlying punctulation.

Sparse short hairs on body. Head, mandibles, antennae and pronotum orange; rest of body brownish black; legs yellow.

Known only from the holotype.

Queen and male unknown.

Bionomics: Collected live from web of a theridiid spider, about 1 m from ground in low

vegetation. I collected both the spider and its prey as the spider was struggling to wrap the ant in silk (DEMG, unpublished notes).

Etymology: The name of the new species is a patronym lovingly dedicated to my father, Honesto C. General, who recently celebrated his 90th birthday.

***Harpegnathos alperti* General sp. n.**

[urn:lsid:zoobank.org:act:6B58C862-57D7-4EFA-BF6A-B5D216BA99A3](https://zoobank.org/act:6B58C862-57D7-4EFA-BF6A-B5D216BA99A3)

Holotype. PHILIPPINES: Luzon Island, Camarines Sur, Naga City, Panicuason Village, 500-550 m \pm 500 m, 13°40'11" N, 123°19'47" E \pm 4 km, 12.iii.2003, coll. D.E.M. General, G.D. Alpert, *et al.* (PNM 13015, deposited in PNM).

Description of worker (Figs. 5-8)

Measurements: TL 19.45, HL 2.81, HW 2.55, CI 91, SL 2.60, SI 102, MandL 3.54, MI 126, MLO 3.64, PW 2.03, ML 5.04, PetL 1.35, PetH 0.88, HFL 3.22, MtL 4.16, EL 1.40, EW 0.94, EI 55, MOW 0.11 (n=1).

In full face view, posterior margin of head straight; scape exceeds posterior margin of head by at least width of scape; ocelli present; frontal lobes broad, covering antennal sockets; frontal carinae short, as long as about twice width of scape, diverging; clypeus narrowly inserted between frontal lobes; triangular labral lobe present; eyes extremely large, ovate, occupying the anterior lateral margin of head; mandibles converging rather abruptly from attachments; head irregularly reticulo-punctate; antennal scape with sparse, short erect and suberect hairs.

In lateral view, mesosoma long and cylindrical; front coxa well separated from mid- and hindcoxae; front coxa long but distal end not reaching midcoxa; promesonotal suture deeply impressed; metanotal groove obsolete; dorsal face of propodeum very long; propodeal declivity not bounded by lateral carinae; metapleural gland orifice opening laterally, not protected by guard hairs; petiole longer than tall; anterior subpetiolar process triangular; gaster long; sting present and functional; tarsal claws with median tooth.

In dorsal view, irregular striae subparallel, but diverging posterior fourth of pronotum; irregular striae subparallel on mesonotum; propodeum coarsely punctate;

petiole longer than broad; petiole coarsely punctate dorsally and laterally; first and second gastral tergite coarsely punctate over underlying punctulation.

Sparse short hairs on body. Body black; mandibles and antennae chocolate-brown; legs yellowish chocolate-brown.

Comparative Note: This specimen is superficially similar to *H. venator chapmani* Donisthorpe, 1937 which Donisthorpe (1937) considered a black variety of *H. venator* F. Smith, 1858, albeit with sculpturation similar to *H. v. rugosus* Mayr, 1862. The key (see below) summarizes the morphological

differences with a non-type specimen of *H. v. rugosus*. Unfortunately, the holotype of *H. v. chapmani* cannot be located at the MCZC, AMNH, USNM, or BMNH, precluding a direct comparison and a confident determination (DEMG, personal observation; Natural History Museum Data Portal. 2016).

Etymology: This species is named after my mentor and colleague, Dr. Gary D. Alpert, a true friend who hosted all my visits to Cambridge, MA, USA. Gary's fortuitous visit to Naga City and Mt. Isarog firmly redirected my research interest from spiders to ants.

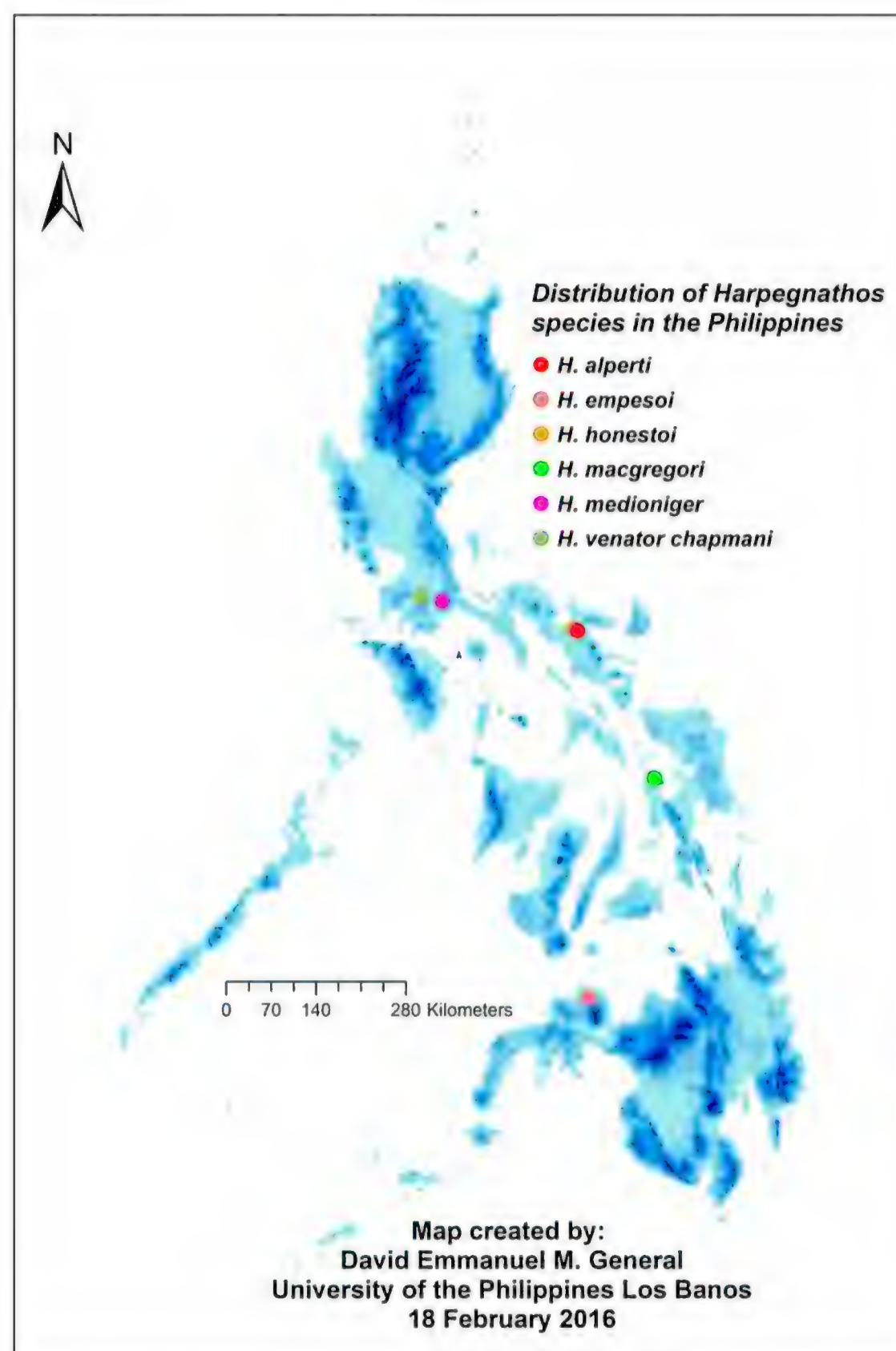


Figure 9. Distribution map of *Harpegnathos* species in the Philippines. Each valid species is known only from its type locality. Darker regions denote areas of higher elevation.

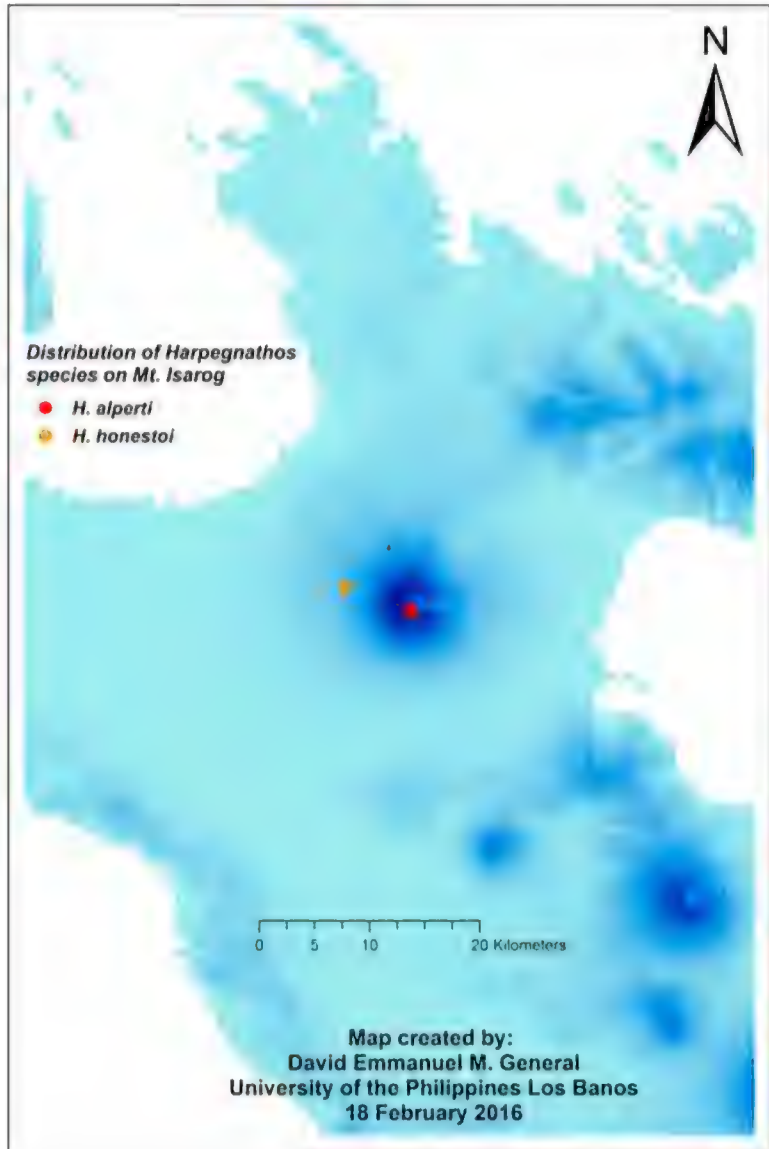


Figure 10. Inset map showing distribution of two *Harpegnathos* species on Mt. Isarog. The coordinates for *Harpegnathos alperti* are representative coordinates for Mt. Isarog Natural Park from the Philippine Gazetteer (DIVA-GIS 2014) and do not indicate the actual collection site for the species.

Key to the Philippine species of *Harpegnathos*, based on the worker

- 1. Dorsum of head reticulo-punctate; mandibles converging rather abruptly from attachments.....2
- Dorsum of head striate; mandibles converging gradually from attachments.....3
- 2. Sculpture on dorsa of pronotum, mesonotum, propodeum and petiole reticulo-punctate; pilosity on body moderately abundant.....*H. venator rugosus* Mayr
- Sculpture on dorsum of pronotum with irregular striae diverging posteriorly; dorsum of mesonotum with irregular but subparallel striae; dorsum of propodeum coarsely punctuate; petiole with dorsal and lateral coarse punctation; pilosity on body sparse*H. alperti* sp. n.
- 3. First and second gastral tergite with coarse punctation over underlying punctulation; in full-face view, posterior margin of head straight; mandibles orange with infuscated base*H. honestoi* sp. n.

- First and second gastral tergite with punctulation only; in full-face view, posterior margin of head shallowly emarginated; mandibles concolorous yellow.....4
- 4. Antennal scape barely exceeds posterior margin of head by about the width of scape; propodeal declivity bounded by lateral carinae; pilosity on body sparse.....*H. empesoi* Chapman
- Antennal scape exceeds posterior margin of head by almost 1/3 length of scape; propodeal declivity not bounded by lateral carinae; pilosity on body moderately abundant.....*H. macgregori* Wheeler & Chapman

Discussion

Harpegnathos honestoi is sympatrically distributed with *H. alperti*, both having been collected in sites less than 5 km apart on Mt. Isarog, Luzon Island, Philippines (Figure 10). This may be the only instance of two *Harpegnathos* species from a single location. Bharti *et al.* (2016) reported the presence of *H. saltator* Jerdon, 1851 and *H.*

saltator cruentatus (F. Smith, 1858) in the Indian states of Karnataka, Kerala, Maharashtra, and of *H. saltator* and *H. venator* (F. Smith, 1858) in the Indian states of Punjab, Tamil Nadu, and West Bengal. It is not clear how closely sympatric their distributions are within the confines of each State.

The presence of at least two species of *Harpegnathos* in close proximity on Mt. Isarog suggests the conservation importance of the forest of that single mountain. There is much to discover on Mt. Isarog. Because the natural history and interaction of these two species is unknown, it is imperative that the remaining forest of Mt. Isarog be conserved for future field research.

More field work is needed at both Mt. Makiling (the type locality of *Harpegnathos venator chapmani*) and Mt. Isarog to elucidate the taxonomic status of *H. v. chapmani*. The natural history of the Philippine species of *Harpegnathos* also needs to be studied.

Acknowledgments

I am extremely grateful to Gary Alpert and Mary Corrigan for graciously hosting my visit to Cambridge, MA for this study. I also thank Gary for teaching me how to use his new imaging system and to edit the images for publication. I greatly appreciate the constructive comments and suggestions of Francisco Hita Garcia and Phil Ward which much improved the paper. Thanks to Stefan Cover and Jignasha Rana for her assistance in the MCZ Ant Room and to JJ Dida of the Institute of Renewable Natural Resources, UPLB for the use of his computer to generate the map. Finally, I am very grateful to the Harvard University Grant Committee for providing an Ernst Mayr Travel Grant for my visit to MCZ and to Linda Ford for allowing me access to the MCZ Ant Room.

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On a new species of *Amitus* Haldeman (Hymenoptera: Platygasteridae) parasitizing whitefly *Zaphanera* sp. (Aleyrodidae) on *Vigna trilobata* from India

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Abstract

Amitus vignus sp. n., (Hymenoptera: Platygasteridae: Sceliotrachelinae) reared from the whitefly *Zaphanera* sp. (Hemiptera: Aleyrodidae) is described from India. This is the first report of a Platygasterid parasitoid from *Zaphanera* Corbett, earlier only Encyrtidae and Aphelinidae were known attacking this whitefly genus. A key to species of *Amitus* spp. from India is also provided.

Keywords: *Platygasteridae*, *Amitus*, new species, *Zaphanera*, key, parasitoid, India

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Introduction

Members of genus *Amitus* (Hymenoptera: Platygasteridae) are of great economic significance as they attack the immature stages of whiteflies (Masner and Huggert, 1989). *Amitus* Haldeman 1850, *Aleyroctonus* Masner and Huggert, 1989 (Hymenoptera: Platygasteridae: Sceliotrachelinae) and *Isostasius* Förster, 1856 (Hymenoptera: Platygasteridae: Platygasterinae) have been reported as parasitoids of Aleyrodidae (Hulden, 1986; Vlug, 1995). This is the first report of a platygasterid parasitoid from *Zaphanera* Corbett 1926 (Homoptera: Aleyrodidae), earlier only Encyrtidae and Aphelinidae were known attacking this whitefly genus (Evans, 2007). Twenty two species of *Amitus* are known worldwide (Cora and Johnson, 2015). But from the Oriental region as well as from India, *Amitus* is represented by only three species (Veenakumari *et al.*, 2014). The first described species of *Amitus* from India is *A. aleurolobi* Mani, reared from *Aleurolobus barodensis* (Maskell) on *Saccharum officinarum* L. (Vlug, 1995). Recently, Veenakumari *et al.* (2014) described two more species from India. Here we document the fourth species, *Amitus vignus* sp.n.

parasitizing the whitefly *Zaphanera* sp. on *Vigna trilobata* Walp.

Whiteflies are a great threat to agriculturists throughout the world. They are primarily the pest of vegetables, crops, Citrus, Cotton, Sugarcane, Teak, Guava, Papaya, Banana etc. Both nymphs and adults cause damage to plants by sucking their sap; adult flies are vectors of many plant viral diseases (Begum *et al.*, 2011). Intense attack by *Zaphanera* Corbett has resulted even in the death of one of its host trees, the western myall tree, *Acacia papyrocarpa* (Bailey *et al.*, 2001).

Materials and Methods

Standard morphological terminology and abbreviations are after Masner & Huggert (1989) and Miko *et al.* (2007). Description and imaging were carried out employing Leica M 205A microscope with automated multiple image capture at preset focal levels using an Leica DFC 500 camera, and image combination using the Leica Application Suite image processing system. Composite images were edited using Adobe Photoshop CS8 to remove artifacts from stack processing and standardize

background colour. Holotype and paratypes are deposited at the Zoological Survey of India, Calicut. Abbreviations: OOL= oculo ocellar line; LOL= lateral ocellar line; OD= ocellar diameter; POL= posterior ocellar line; A1-A10= antennal segments 1-10; IOS= interorbital space; T1-T6= metasomal tergites 1-6. Specimens were card mounted and were air dried.

Amitus Haldeman, 1850

Diagnosis (Modified after Masner and Huggert, 1989):

Body black, short (usually less than 1.5 mm), dorsoventrally flattened; antennal formula 8-10; female antenna with abrupt, compact ovoid clava resulting from the fusion of A8-A10; male antenna with specialized paddle-shaped area on A4; propodeum partly covered with foamy structures; forewings without distinct veins; metasoma short, subsessile; T2 usually with a fan of striae anterolaterally.

Key to Indian species of *Amitus* Haldeman, 1850 (Based on females)

1. Clava 2.5× as long as wide*A. kiefferi*
Veenakumari and Buhl
 - Clava as long as or more than 3.4× as long as wide2
2. Forewing length more than 3.5× width; head 1.78× as wide as high.....*A. aleurolobi* **Mani**
 - Forewing length less than 3× as width; head less than 1.6× as wide as high.....3
3. A1 5.86× as long as wide; POL greater than 2.5× LOL; POL at least 2.29× OOL.....*A. sikkimensis*
Veenakumari and Buhl
 - A1 4.75× as long as wide; POL less than 2.25× LOL; POL only 1.8× OOL.....*A. vignus* sp. n.

Treatment of species

Amitus vignus Anjana et al. sp. n. (Figs. 1- 11)

[urn:lsid:zoobank.org:act:8857299F-AC7E-48D4-8FBC-EE440C669697](https://zoobank.org/act:8857299F-AC7E-48D4-8FBC-EE440C669697)

Diagnosis: Body length 0.81-0.87 mm (n=12); scape 4.75× as long as wide; A4 1.67× as long

as wide; forewing 2.78× as long as wide; T2 1.5× as wide as long.

Description: *Female:* Length 0.82 mm (holotype) (Fig. 1); Body black; A1-A2 yellow, clava brown; rest of the segments yellowish brown; legs except tarsi brown; tarsi yellowish brown.

Head: Head from above 1.76× as wide as long (Fig. 3), hyperoccipital carina absent; vertex and occiput coarsely reticulated; eyes bare; frons not smooth, coriaceous; OOL 2.5× OD; OOL 1.25× LOL; POL 2.25× LOL; IOS 1.36× eye height and 0.6× width of head; eye height (in dorsal) 0.1× temples; head in front view with undulations (marked in Fig. 2), 1.24× as wide as high; scape 4.75× as wide as long, clava 3.4× as wide as long, A5 and A6 subequal, ratio of length and width of antennal segments A1-A7 and clava being: 0.19: 0.04; 0.07: 0.04; 0.04: 0.02; 0.05: 0.03; 0.05: 0.03; 0.05: 0.03; 0.05: 0.04, 0.17: 0.05 respectively (Fig. 5).

Mesosoma: 1.03× as long as wide; mesoscutum reticulate with sparse setae laterally, 1.26× as long as wide; notauli complete, broader apically, than basally; upper lateral pronotal area coriaceous; mesopleura with several longitudinal lines below tegula; mesopleural depression with a deep sulcus; metapleura bare anteriorly, posteriorly with very few white setae; scutellum 1.8× as wide as long; (Fig. 4). Forewing 1.2× as long as body and 2.78× as long as wide, with fine and dense microtrichia; marginal cilia 0.22× forewing width (Fig. 8).

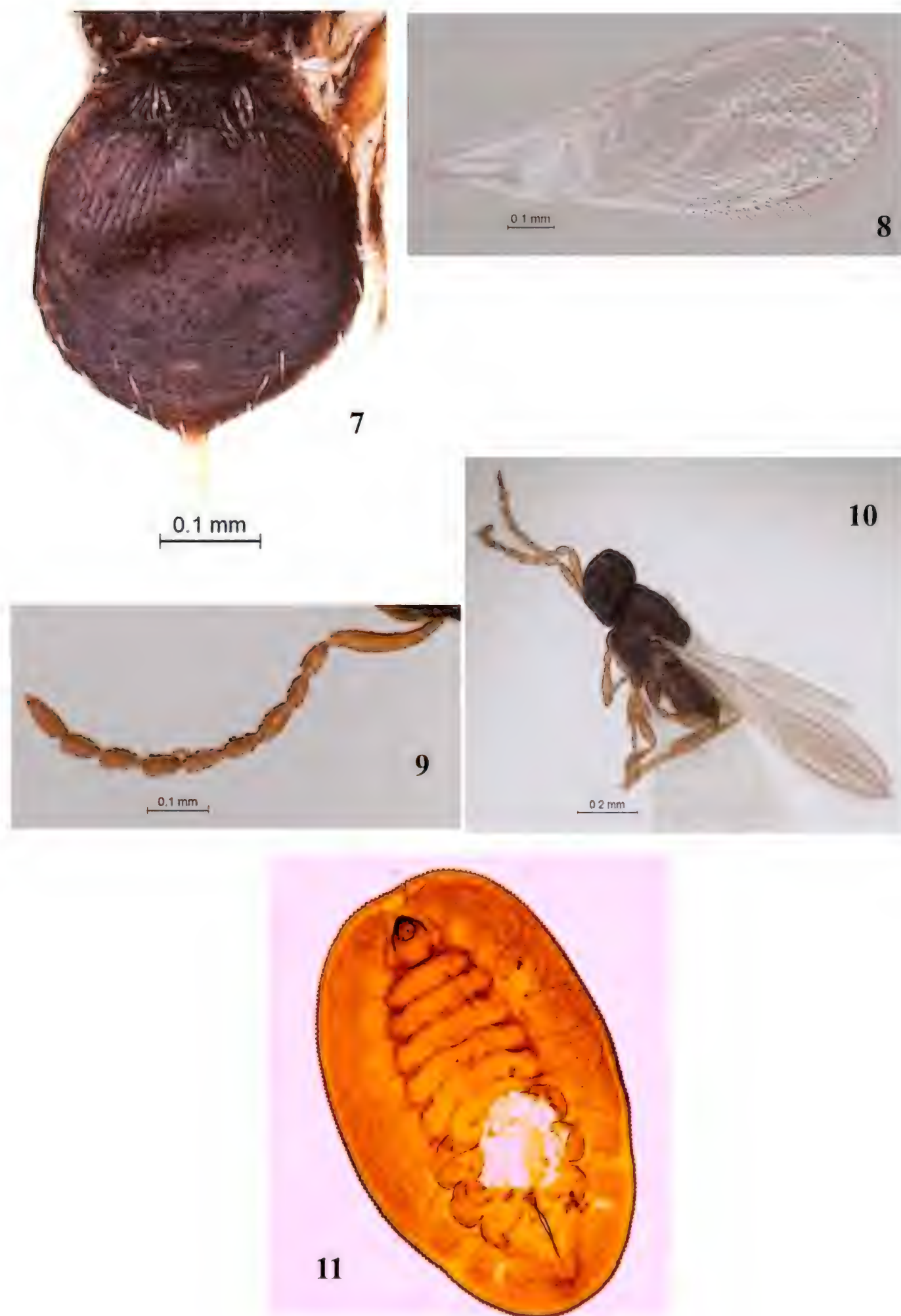
Metasoma: 1.33× as long as wide; T2 with submedial pits with fan of striae anterolaterally; 1.5× as wide as long; T3- T6 without any distinct sculpture; single setae present laterally on T3- T6; length and width of T1-T6 being: 0.06: 0.26; 0.21: 0.32; 0.03: 0.29; 0.02: 0.22; 0.02: 0.13; 0.02: 0.06 respectively (Fig. 7).

Male: Similar to female except in the following characters. Body length: 0.70- 0.72 mm (n=2) (Fig. 9); the ratio of the antennal segments being: 0.18: 0.04; 0.06: 0.03; 0.05: 0.03; 0.07: 0.04; 0.07: 0.03; 0.07: 0.03; 0.07: 0.04; 0.07: 0.04; 0.07: 0.07; 0.1: 0.04 respectively (Fig. 10).

Variations: The females have a body size ranging from 0.81-0.87 mm and male from 0.70-0.72 mm. Though very slight variations



Figures 1-6: *Amitus vignus* sp. n. Female: 1. Habitus; 2. Head front (undulations marked by an arrow); 3. Head dorsal; 4. Antenna; 5. Mesosoma lateral view; 6. Mesosoma dorsal



Figures 7-11: 7. Metasoma dorsal; 8. Fore wing; 9-10. *Amitus vignus* Male: 9. Antenna; 10. Habitus; 11. IV instar of puparium from which parasitoid emerged.

from the holotype were observed in the paratypes with regard to the size and proportions of antennal segments, they were rather insignificant.

Host. *Amitus vignus* **sp. n.** was reared from the parasitised puparium of *Zaphanera* sp. on *Vigna trilobata* collected on 06-ix-2012 from Bhiwandi, Mumbai (19.296664°N 73.063121°E; elevation 79ft). Two, five, four and three parasitoids emerged from the IV instar of the puparium (Fig. 11) on the dates 09-09-2012, 10-09-2012, 11-09-2012 and 12-09-2012 respectively.

Etymology: The species name 'vignus' is after the generic name of the host plant.

Material examined: Holotype, 'INDIA: Maharashtra: Bhiwandi: Mumbai (19.296664°N 73.063121°E; elevation 79ft), 09-ix-2012, Coll. Vimala D, on card, Reg. No. ZSI/WGRS/IR. INV.4982, Paratypes, 1 ♀; same data except date; 09-ix-2012; on card; Reg. No. ZSI/WGRS/IR. INV.4983; 1 ♂; same data except Reg. No. ZSI/WGRS/IR. INV.5171; 1 ♀; same data except Reg. No. ZSI/WGRS/IR. INV.5172; 1 ♀; same data except date; 10-ix-2012; Reg. No. ZSI/WGRS/IR. INV.5173; 2 ♀; same data except Reg. No.s. ZSI/WGRS/IR. INV.5174- 5175; 4 ♀; same data except Reg. No.s. ZSI/WGRS/IR. INV.5176-5179; 2 ♀; same data except Reg. No.s. ZSI/WGRS/IR. INV.5180-5181; 1 ♂; same data except Reg. No.s. ZSI/WGRS/IR. INV.5182.

Comments: Most of the species of genus *Amitus* were erected based on the quantitative characters like antennal measurements and POL, OOL, LOL ratios, rather than qualitative ones. The Indian species *A. kiefferi*, *A. sikkimensis* and *A. aleurolobi* were separated mainly by the difference in the antennal measurements and dimensions of the head (Veenakumari *et al.*, 2014). The Oriental species, *A. hesperidium* Silvestri, 1927 is having head more than 2× as long as wide whereas, it is only 1.76× as wide as long in *Amitus vignus* **sp. n.** Viggiani and Mazzone in 1982, gave a key to species present in Italy and Hulden, in 1986 provided a key to species of *Amitus* in Finland. *Amitus vignus* sp.

n. when compared with the descriptions of the species outside Oriental region comes nearest to Palearctic species *A. vesuvianus* Viggiani and Mazzone (1982), but can be differentiated in the following characters: occiput and vertex is very weakly reticulate in *A. vesuvianus* whereas, it is coarsely reticulated in the new species; also A3 is elongate, 3× as long as wide and forewing is only 2.53× as wide in *A. vesuvianus*, whereas A3 is only 2× as long as wide and forewing is 2.78× as long as wide in *A. vignus* **sp. n.**

The holotype of *A. sikkimensis* was studied by the first author. *A. vignus* **sp. n.** resembles *A. sikkimensis* Veenakumari and Buhl. The length to width ratio of mesosoma is same in both species and also has several transverse rugae on mesopleuron. However, both differ notably in the characters given in the key, in the measurement of the clava (clava is 3.4× as long as wide in *A. vignus* **sp. n.** whereas it is 3.75× as long as wide in *A. sikkimensis*) and shape of the head (head evenly round in *A. sikkimensis* without undulations as in Fig. 10 (Veenakumari *et al.*, 2014), whereas with distinct undulations in *Amitus vignus* **sp. n.**). The POL is 2.96× LOL and OOL is 1.29× LOL in *A. sikkimensis* whereas POL is only 2.25× LOL and OOL 1.25× LOL in *A. vignus* **sp. n.**, *A. aleurolobi* Mani and *A. kiefferi* Veenakumari and Buhl can be differentiated by the characters given in the key.

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***Romblonella longinoi* (Hymenoptera: Formicidae), a new species and first record of the genus from Sabah, Malaysia, with a key to the species of *Romblonella* Wheeler, 1935**

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Abstract

A new species of *Romblonella* Wheeler, 1935 from Sabah represents the first record of the genus for Malaysia. The worker and the associated male alate of *Romblonella longinoi* sp. n. are described. This new species is easily distinguished from all known species by its posteriorly broadened head capsule and coloration. An identification key to the workers of *Romblonella* is provided.

Keywords: *Romblonella*, *Formicidae*, *Sabah*, *new species*, *identification key*

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Introduction

Romblonella Wheeler, 1935 is a small genus of myrmicine ants, with nine known species distributed from the Philippines to islands of the South Pacific, New Guinea, and Australia (Bolton, 2015; General and Buenavente 2015, Shattuck *et al.*, 2014; Taylor, 1991).

During the peer-review process of my previous paper describing *Romblonella coryae* General and Buenavente, 2015 from the island of Palawan, Philippines, I was asked about a nest series collection from Sabah. The Sabah material turned out to be a distinctive new species, which I now describe in this present contribution.

Materials and Methods

Specimens were examined and measured with a Leica S8 stereomicroscope with ocular micrometer at PNM. Type specimens of other species were examined and measured with a Wild 5A stereomicroscope with ocular micrometer at MCZC. Images of the wings, head, and antennae were created using a Leica

MC120HD digital camera attached to the Leica S8 stereomicroscope. These images were stacked using Combine ZM. The stacked images were edited with Adobe Photoshop CS5. Images of the external genitalia were created at the MCZC Ant Room with Leica DFC 450 digital camera attached to a Leica M205C stereomicroscope. These source images were stacked with Helicon Focus 5.3 64X. Stacked images were edited with Adobe Photoshop CS5 Extended.

Measurements (in millimetres)

- | | |
|-----|---|
| EL | Maximum diameter of compound eye. |
| EW | Maximum width of compound eye. |
| GL | Maximum length of gaster, from base of first gastral tergite to apex of gaster, measured in lateral view. |
| HL | Maximum head length in full face view, measured from anterior-most point of clypeal margin to posterior-most point of head capsule. |
| AHW | Anterior head width, maximum width in front of the compound eyes, in full face view. |

PHW	Posterior head width, maximum width behind the compound eyes, in full face view.
ML	Mesosomal length measured from anterior edge of the pronotum (excluding the collar) to posterior edge of propodeal lobe.
PW	Maximum width of pronotum in dorsal view.
SL	Length of scape, excluding basal neck and condyle.
SPL	Propodeal spine length, maximum distance from inner posterior margin of propodeal spiracle to propodeal spine apex.
PetL	Petiole length, straight line length, in lateral view, from anterior margin of petiolar denticle to posterior inflection.
PetW	Maximum width of petiole in dorsal view.
PetH	Petiolar height in lateral view, measured as the perpendicular distance from the ventral margin to the highest point of posterolateral tubercles.
PPL	Postpetiole length, straight line length, in lateral view, from anterior to posterior inflections.
PPW	Maximum width of postpetiole in dorsal view.
PPH	Measured from sternal process base to postpetiole apex in lateral view.
TL	The total outstretched length of ant from mandibular apex to gastral apex; when measured in profile the sum of mandibular length + head length + mesosomal length + lengths of waist segments + length of gaster.

Indices

CI	Cephalic index: PHW/HL x 100.
EI	Eye Index: EL/PHW x 100.
SI	Scape index: SL/PHW x 100.

Collection Abbreviations (Brandão, 2000)

ANIC	Australian National Insect Collection, Canberra, Australia.
BMNH	Natural History Museum, London, UK.
CASC	California Academy of Sciences, San Francisco, CA, USA.

DMGC	Private Collection, David Emmanuel M. General.
JTLC	Private Collection, John T. Longino.
MCZC	Museum of Comparative Zoology, Harvard University, Cambridge, MA, USA.
PNM	National Museum of the Philippines, Manila, Philippines
USNM	United States National Museum of Natural History, Washington, D.C., USA.

Synonymic list of species

coryae General, 2015 [holotype examined]
elysii (Mann, 1919) [cotype examined]
heatwolei Taylor, 1991 [not seen]
liogaster (Santschi, 1928) [not seen]
 = *vitiensis* M.R. Smith, 1953
 (synonymy by Sarnat and Economo 2012: 121) [not seen]
opaca (F. Smith, 1861)
 = *grandinodis* Wheeler, 1935
 (synonymy by Bolton 1976: 294) [syntype examined]
palauensis M.R. Smith, 1953 [paratype examined]
scrobifera (Emery, 1897) [not seen]
townesi M.R. Smith, 1953 [paratype examined]
yapensis M.R. Smith, 1953 [paratype examined]

Taxonomy

Romblonella Wheeler, 1935

Type species: *Romblonella grandinodis* Wheeler, 1935 (junior synonym of *Myrmica opaca* F. Smith, 1861), by original designation.

Romblonella longinoi General sp. n.

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Measurements and indices

Worker measurements of holotype worker [paratype (n=17) mean: range in brackets]: TL 4.01 [3.97: 3.67-4.14], HL 0.90 [0.89: 0.79-0.97], AHW 0.63 [0.69: 0.61-0.77], PHW 0.85 [0.84: 0.77-0.90], SL 0.54 [0.50: 0.36-0.58], EL 0.13 [0.18: 0.12-0.22], EW 0.13 [0.13: 0.11-0.14], PW 0.67 [0.63: 0.58-0.67], ML 1.13 [1.07: 1.01-1.13], SPL 0.43 [0.38:

0.32-0.43], PetL 0.47 [0.42: 0.38-0.47], PetW 0.36 [0.35: 0.31-0.49], PetH 0.47 [0.43: 0.38-0.49], PPL 0.31 [0.30: 0.27-0.34], PPW 0.45 [0.45: 0.41-0.47], PPH 0.41 [0.39: 0.36-0.41], GL 1.08 [1.17: 1.03-1.42].

Indices: CI 82 [86: 80-98], EI 16 [22: 13-25], SI 73 [65: 47-77].

Description of worker (Figures 1-4):

In full face view, posterior margin of head shallowly emarginate; head longer than wide; sides of head diverging posteriorly; eyes laterally located, slightly behind midlength of head; shallow scrobe present; frontal carina long, almost reaching the posterior margin of head; scapes short, exceeding posterior edge of eye by about 2X width of distal scape; antennal formula 12:3; mandibles triangular, with 6 robust teeth; palp formula 5:3; median clypeus carinate, with a median carina flanked by 3 pairs of lateral carinae; median clypeus inserted between frontal lobes and about as wide as frontal lobe; anterior clypeal margin entire, without an isolated median seta; head rugoreticulate with short cross-hatches that reach the adjacent rugae; punctae in interstitial spaces; mandibles striate.

In lateral view, dorsal margin of mesosoma evenly convex and arched, without grooves or sutures; propodeal spines long and stout; petiole sessile, with anterodorsally directed angle over petiolar spiracle; petiole massive, larger and taller than postpetiole; anterior subpetiolar denticle present; spurs absent on meso- and metatibia.

In dorsal view, pronotum with angulate humeri; sides of promesonotum converging posteriorly; sides of propodeum subparallel but bulging slightly anterior to propodeal spiracle; stout propodeal spines slightly divergent through their entire length; mesosoma, petiole and postpetiole dorsally reticulate with interstitial punctulae; first gastral segment(= 4th abdominal) punctulate.

Head with evenly distributed short, blunt erect hairs that are shorter than distance between them; scape with suberect hairs; short, blunt

erect hairs sparsely distributed over rest of body. Body distinctly bi-colored; body yellow to orange except for brown antennal club, legs, distal and lateral edges of first gastral segment, and gastral segments 2-5.

Mean measurements (range in brackets) and indices of male paratype (n=2): TL 4.0 [3.96-4.03], HL 0.72 [0.68-0.76], AHW 0.40 [0.40-0.40], PHW 0.69 [0.68-0.70], SL 0.15 [0.14-0.16], EL 0.38 [0.37-0.40], EW 0.28 [0.28-0.29], PW 0.57 [0.56-0.58], ML 1.14 [1.13-1.15], GL 1.30 [1.30-1.30], CI 96 [93-100], EI 55 [53-58], SI 73 [70-76].

Diagnosis of male paratype (Figures 5-15):

Alate; approximately as long as worker, but more gracile.

In full-face view, head longer than broad; sides of head diverging posteriorly, posterior head width behind compound eyes about $\frac{3}{4}$ wider than anterior head width; ocelli not unusually large (compared with images of male *R. palauensis*, M.R.Smith, 1953), width of ocelli subequal to distance between lateral ocellus and median ocellus; lateral ocelli separated by about 2X width of median ocellus; compound eye large, convex, occupying about $\frac{2}{3}$ side of the head; posterior margin of head medially straight, laterally with lobes; antenna long, subfiliform, with 13 segments (Figures 6 and 7); length of antennomeres (one male measured) antennal scape, 0.08 mm; antennomere 2, 0.04 mm; antennomere 3, 0.27 mm; antennomere 4-7, range = 0.12-0.19 mm; antennomere 8, 0.23 mm; antennomere 9-13, range = 0.13-0.18 mm; antennomere 4-7 slightly and gently broadened distally, such that the basal end of succeeding segment is narrower than the distal end; antennomere 3-7 broader than antennomere 8-13; clypeus broadly projecting anteriorly, forming a rounded obtuse angle; mandible triangular, well-developed and functional; masticatory margin with 6 sharp triangular teeth; apical tooth longest, about 2X longer than preapical tooth; tooth 4 smallest; rest of teeth subequal; palp formula 5:3.

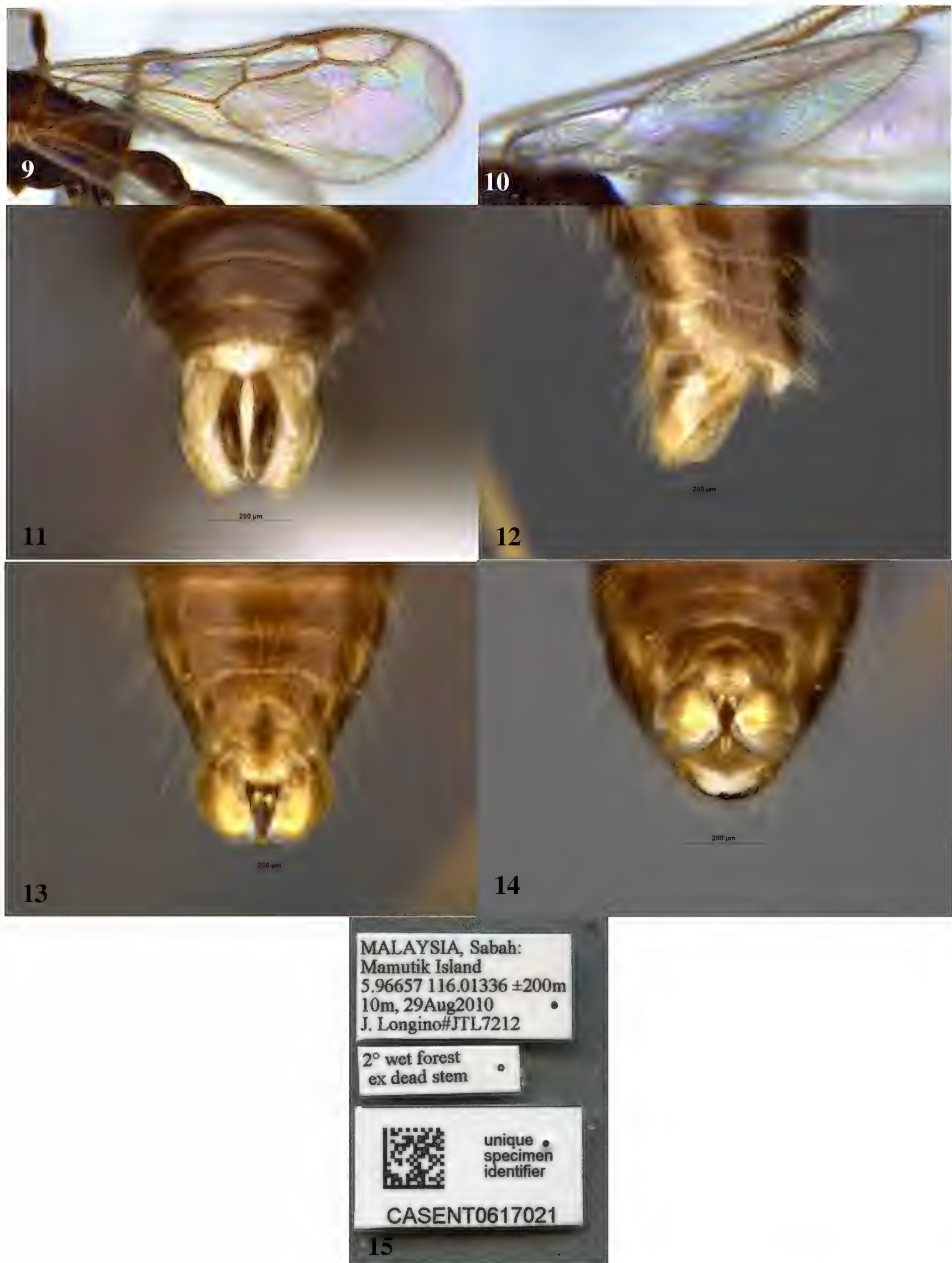
Romblonella longinoi, a new species and first record of the genus from Sabah, Malaysia



Figures 1-4. *Romblonella longinoi* sp. n. (holotype): 1. lateral view; 2. full-face view; 3. dorsal view; 4. labels. Images kindly provided by Dr. John T. Longino.



Figures 5-8. *Romblonella longinoi* sp. n. (paratype male): 5. lateral view; 6. full-face view; 7. head and antennae; 8. dorsal view. Images 5, 6, and 8 kindly provided by Dr. John T. Longino and image 7 kindly provided by Perry Buenavente.



Figures 9-15. *Romblonella longinoi* sp. n. (paratype male): 9. forewing; 10. hindwing; 11. dorsal view of external genitalia; 12. lateral view of external genitalia; 13. ventral view of external genitalia; 14. apical view of external genitalia; 15. labels. Images of wings kindly provided by Perry Buenavente.

In lateral view, lower portion of compound eye not obscuring gena and ventral margin of head; pronotum with a flat dorsal outline; mesonotum forming a low dome that slopes gently posteriorly to the propodeal dorsum; mesepimeron not bearing epimeral lobe; vertical impression on anterior third of metakatepisternum; propodeal spiracle circular; propodeal declivity almost vertical, forming a rounded obtuse angle with the propodeal dorsum; petiole tube-like, more than 2X longer than tall, with an indistinct, truncated node; postpetiole about half as long as petiole, with a low, rounded node; first gastral segment (AIV) longest, about half the length of gaster; tibial spurs absent on middle and hind legs; external genitalia as in Figures 11 to 14.

In dorsal view, notauli and parapsidal furrows present; notauli abbreviated, not meeting posteriorly; petiole longer than wide; postpetiole wider than petiole; gaster elongate-ovate.

Forewing (Figure 9) with pterostigma; cross-veins 1r-rs and 2r-rs present; free abscissa 2rs-m originating at distal 2/3 of Rs (radial sector) vein. Four closed cells present: C, R, 2R1, and 3R1. Hindwing as in Figure 10.

Clypeus carinate, with about 6 short, sinuate longitudinal carinae; head longitudinally rugulose, with short cross-hatches that do not reach the adjacent rugula, and with a ground surface of fine reticulation; mandibles longitudinally carinate; dorsal mesosoma rugulo-reticulate; propodeum transversely rugose; petiole dorsally and laterally rugo-reticulate; postpetiole dorsally and laterally rugulo-reticulate; gaster finely reticulate dorsally.

Pale yellow erect and sub-erect hairs evenly but sparsely distributed all over body; legs with decumbent hairs; antennae with yellowish, short, fine hairs.

Body and distal 5 antennal segments brown; mandibles, basal 8 antennal segments and tarsi yellowish-brown.

Gyne unknown.

Material examined

Holotype worker, "MALAYSIA: Sabah, Mamutik Island, 10 m asl, 5.96657°N, 116.01336°E ±200m, 29.VIII.2010, leg. J. Longino, JTL7211, ex dead stem,

CASENT0617007" (deposited in CASC). Paratypes (17 workers, 2 male alates) same data as holotype (deposited in ANIC, BMNH, CASC, DMGC, JTLC, MCZC, USNM).

Bionomics: This species, represented by a nest series, was collected from a dead stem in wet tropical forest.

Etymology: This species is dedicated to my friend and colleague, Dr. John T. Longino, who collected this rare nest series with 2 associated males.

Comparative Notes

The worker of *R. longinoi* **sp. n.** is distinguishable from the workers of all known species of the genus in its head capsule that is posteriorly broadened. All other species possess a head capsule that is roughly parallel-sided. Other morphological differences are summarized in the key. In addition, *R. longinoi* **sp. n.** workers are colored differently from any other *Romblonella* species.

The male *R. longinoi* **sp. n.** is distinguished from *R. palauensis* M.R. Smith, 1953 by the following characters: sides of head diverging posteriorly, ocelli not unusually large, lateral ocelli separated by about 2X width of median ocellus; compound eye large, convex, occupying about 2/3 side of the head, lower portion of compound eye not obscuring gena and ventral margin of head, free abscissa 2rs-m originating at distal 2/3 of Rs (radial sector) vein, and propodeum transversely rugose (Smith, 1953).

Discussion

Despite the wide distribution of *Romblonella* species across the south and west Pacific, these ants are not easy to find. In a recent survey of the Fiji ants, Sarnat and Economo (2012) were unable to find *R. liogaster* Santschi, 1928 in its type locality.

Romblonella ants are ground foragers, typically collected in leaf litter samples (AntWeb, 2016) although *R. coryae* may be arboreal (General and Buenavente, 2015). Nest series are rarely collected and this present contribution describes one of only three known

nest series of *Romblonella* ants (AntWeb, 2016; Taylor, 1991).

This present contribution provides only the second description of the male caste of *Romblonella* 63 years after M.R. Smith described *R. palauensis*. Taylor (1991) simply mentioned the existence of the male of *R. heatwolei* Taylor, 1991 but did not provide a description or an illustration.

The genus *Romblonella* now includes 10 valid species. This number may increase with more intensive sampling of other localities in the Philippines, Borneo, New Guinea, and perhaps, New Caledonia.

Key to the species of *Romblonella*, based on the worker caste

- 1 In profile, petiole longer than tall, relatively flat dorsally, without a round dorsal outline***R. palauensis* Smith, 1953** (Palau Islands)
 - In profile, petiole taller than long, with a round dorsal outline.....2
- 2 In full-face view, dorsum of head longitudinally carinate.....3
 - In full-face view, dorsum of head reticulate.....6
- 3 Dorsum of head with interrupted longitudinal carinae.....***R. heatwolei* Taylor, 1991**(Australia)
 - Dorsum of head with longitudinal carinae that extend from posterior margin of clypeus to posterior margin of head.....4
- 4 Mesosoma, petiole and postpetiole dorsally longitudinally carinate***R. yapensis* Smith, 1953** (Micronesia: Caroline Islands)
 - Mesosoma, petiole and postpetiole dorsally reticulate.....5
- 5 In full-face view, sides of head diverging posteriorly; frontal carinae longer, almost reaching posterior margin of head; posteromedian clypeus as wide as frontal lobe.....***R. longinoi* sp. n.** (Mamutik I., Borneo)
 - In full-face view, sides of head subparallel; frontal carinae shorter, more than one eyelength from posterior margin of head; posteromedian clypeus wider than frontal lobe.....***R. townesi* Smith, 1953** (Marianas Islands)

- 6 Dorsum of first gastral tergite longitudinally costulate with interstitial punctulae; in full-face view, head subrectangular (CI 84-89); median clypeus narrow, only as wide as frontal lobe.....***R. coryae* General, 2015** (Palawan I., Philippines)
 - Dorsum of first gastral tergite smooth, punctulate or reticulate but never longitudinally costulate; in full-face view, head subquadrate (CI >94); median clypeus wider than frontal lobe.....7
- 7 Dorsum of first gastral tergite smooth***R. liogaster* (Santschi, 1928)** (Fiji I.)
 - Dorsum of first gastral tergite finely punctulate or reticulate, but never smooth.....8
- 8 Dorsum of mesosoma longitudinally carinate, with scattered cross-hatches; median clypeus without well-developed median carina.....***R. scrobifera* (Emery, 1897)** (New Guinea)
 - Dorsum of mesosoma reticulate; median clypeus with well-developed median carina.....9
- 9 In dorsal view, propodeal spines divergent throughout their entire length; body concolorous yellow.....***R. elysii* (Mann, 1919)** (Solomon Islands)
 - In dorsal view, propodeal spines basally divergent but distal half parallel or curved slightly inward; body dark-brown with lighter appendages.....***R. opaca* (F. Smith, 1861)** (Indonesia, Philippines)

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Aquatic and Semi-aquatic Heteroptera (Insecta: Hemiptera) of Terai-Dooars Region of West Bengal, India

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Abstract

Terai and Dooars region of West Bengal is highly diversified area, located in the Darjeeling Himalayan foot hills. A total of 49 species under 30 genera and 13 family of aquatic and semi-aquatic Heteroptera, commonly known as water bugs, were collected from this region of West Bengal during a survey conducted between 2011 - 2013, of which four species were already published as new species and one species is a new report to India. Collection data and their worldwide distribution are provided in this communication. *Aphelocheirus thirumalaii* Basu, Subramanian and Saha, *Onychotrechus dooarsicus* Subramanian, Basu and Zettel, *Pleciobates bengalensis* Jehamalar, Basu and Zettel, *Amemboa bifurcata* Basu, Subramanian and Polhemus and *Amemboa mahananda* Basu, Subramanian and Polhemus have been already described as new species and published elsewhere.

Key words: *Aquatic and semi-aquatic Heteroptera, Terai, Dooars, Himalayan foot hills, West Bengal.*

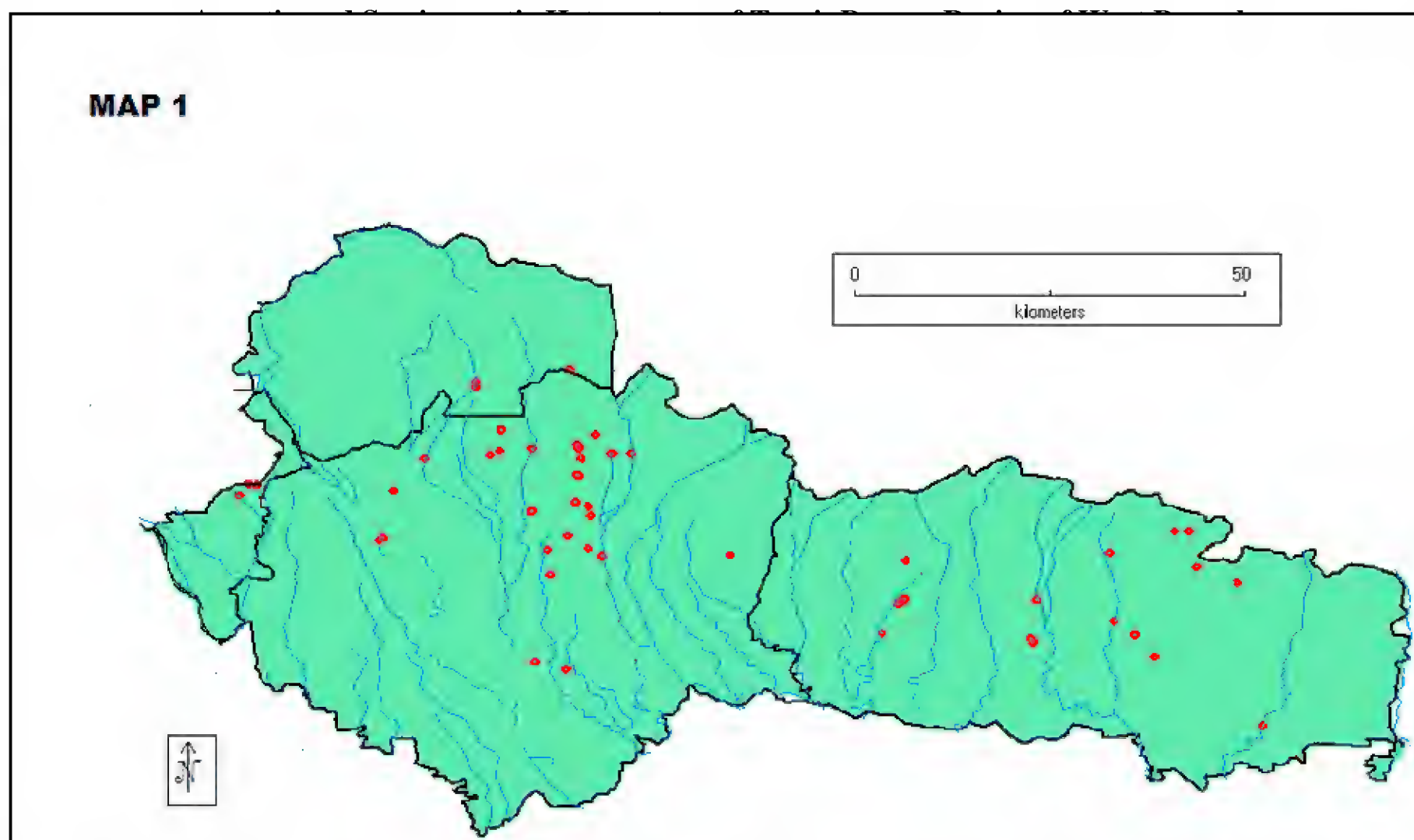
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Introduction

Eastern Himalayan landscape has been recognized as one of the major 'Biodiversity Hotspots' in India because of its varied landscapes, variety of vegetation types and climatic conditions, as well as its unique flora and fauna with high degree of endemism (Myres *et al.*, 2000) and is receiving global attention for biodiversity conservation in recent times. The Eastern Himalaya is at the crossroads of two continental plates represented by two biogeographical realms: the low-land Indo-Malayan Realm and to the north, the Palaearctic Realm. Although, this inaccessible landscape supports a variety of flora and fauna with good number of new species continuing to be discovered year after year, this area is poorly surveyed for faunal exploration and there are large areas that are still biologically unexplored including Himalayan foothills. The northern part of Bengal, mainly Darjeeling hills and surrounding areas, is crisscrossed by deep gorges of the river Teesta and

its tributaries. It is represented by the flood plains of Teesta and the foot-hills of Himalayas. The other rivers flowing across this region are Mahananda, Torsha, Raidhak, Sankosh and Jaldhaka etc. The terai- dooars region of Bengal comprises various well-known protected areas such as Jaldapara Wildlife Sanctuary, Gorumara National Park, Chapramari Wildlife Sanctuary, Mahananda Wildlife Sanctuary, Buxa Tiger Reserve, and several other forests like Khairabari Reserve forest, Jayanti forest, Chilapata forest etc. These versatile forests varies from riverine to dense-mixed wet forest extending between low to high gradient of altitude and crisscrossed by a number of rivers and their tributaries and this variation supports diverse types of life forms including insects.

The aquatic and semi-aquatic Hemiptera, commonly known as water bugs, are one of the major components of freshwater ecosystem and chiefly consists of two infraorders- Nepomorpha and Gerromorpha. They play a major role in the



MAP 1. Terai–Dooars region of West Bengal with rivers and their tributaries (blue lines) and sampling sites (red dots)

food web composition and functioning of aquatic ecosystems and an efficient bio-indicator of freshwater eco-health. The present study was conducted in different protected areas of the study area of West Bengal to explore the diversity of aquatic and semi-aquatic Hemipteran species.

Review of earlier studies suggests that the documentation of water bugs in the Eastern Himalayan zone of West Bengal is still fragmentary. In the year of 1994, Bal and Basu documented the fauna of West Bengal, which also includes the species reported by Distant (1903, 1906, 1910) and it shows only 22 species of aquatic and semi-aquatic Heteroptera were reported from the State of West Bengal. But, the present study reported a total of 49 species under 30 genera of aquatic and semi-aquatic Heteroptera from the study area.

Material and Methods

Study site (Map 1)

Terai- Dooars region of Bengal is located in the foothills of Himalaya, comprising grasslands, savannas, dense mixed wet forests, moist deciduous forests, Himalayan sub-tropical broadleaf forests, semi evergreen forests. The whole region is crisscrossed by several rivers like Teesta, Mahananda, Jaldhaka, Raidhak,

Sankosh, Torsha etc. and their tributaries. The river Teesta has divided the North Bengal region into two parts: the eastern Dooars and the western Terai. The present survey was carried out in different wetlands of this region. The major conservation areas like Gorumara National Park, Chapramari Wildlife Sanctuary, Mahananda Wildlife Sanctuary, Buxa Tiger Reserve are situated in the study area.

Methods

The present work was carried out in Darjeeling and Jalpaiguri districts of West Bengal during 2011-2013. The specimens were collected using a rectangle-shaped insect net and a long-handled aquatic net from different freshwater ecosystems. The specimens collected were preserved in 70% ethyl alcohol in Borosil[®] glass vials. The vials were labeled with data pertaining to locality, date and name of the collector in the field. The morphological studies were undertaken using a LeicaM205A Stereozoom binocular microscope. All the measurements are given in millimeters (mm). The male genital segment (VIII) was dissected and immersed in 10% KOH for 30 minutes to dissolve the muscles and soft tissue and to get a clear vision of the chitinised structures. The identifications of species were made using the

works of Hungerford and Matsuda (1958, 1962, 1965), Bal and Basu (1994), Menke (1979) and Thirumalai (1999, 2002, 2007). The material studied is deposited in the National Zoological Collection, Zoological Survey of India, Kolkata.

Results

Infraorder : Nepomorpha

Family Corixidae

1. *Sigara (Tropocorixa) promontoria* (Distant): Plate 1: Fig.1

Material examined: 1♀, West Bengal: Kalikhola, border between Gorumara NP and Chapramari WLS, Jalpaiguri, 17.iii.2013, S. Basu; 1♀, West Bengal: Buri Torsha Riverside, south Khairabari Reserve forest, Jalpaiguri, Date: 19.iii.2013, Coll: S. Basu

Distribution: India.

Remarks: This species can be identified by the presence of six transverse yellowish lines on black pronotum and vertex with rows of obscure punctures throughout the posterior half. This species found in the stagnant forested pool.

2. *Sigara (Vermicorixa) kempi* (Hutchinson): Plate 1: Fig.2

Material examined: 1♂, 1nymph, West Bengal: wetland beside Gajaldoba Teesta barrage, Jalpaiguri, 12.iii.2012, Coll. S. Basu.

Distribution: India.

Remarks: This species can be identified by its dark colour pattern mainly the ectocorium which is dark pitchy brown. It is reported from the Ambari forested area beside the Teesta barrage in Gajaldoba.

Family Belostomatidae

3. *Diplonychus annulatus* (Fabricius): Plate 1: Fig.3

Material examined: 1♀, West Bengal: Pond (1) near Baradighi, Malbazar, Jalpaiguri, 17.ix.2011, Coll: S. Basu; 3♂, 1f, West Bengal: Pond (2) near Baradighi, Mal Bazar, Jalpaiguri, 17.ix. 2011, Coll: S. Basu; 1♂, West Bengal: Raidhak River, Alipurduar, 19.iv.2013, Coll: S. Basu; 4♂, 3♀, West Bengal: Teesta canal, Teesta barrage, Gajaldoba, Jalpaiguri, 13.iii.2011, Coll: S. Basu.

Distribution: India, Bangladesh, Pakistan, Taiwan, China.

Remarks: *Diplonychus annulatus* is a large species (body length ranges from 19-22mm) as compared to the other species of *Diplonychus*. Polhemus (1995) pointed out that this species has a much more restricted distribution. It is abundant in the Dooars region of Bengal.

4. *Diplonychus rusticus* (Fabricius): Plate 1: Fig.4

Material examined: 1♂, 1♀, 4nymphs, West Bengal: Kalipur Wetland, within Gorumara NP., Jalpaiguri, 17.iii.2012, Coll: S. Basu; 2♀, West Bengal: Pond (2) near Baradighi, Malbazar, Jalpaiguri, 17.ix.2011, Coll: S. Basu.

Distribution: India, Australia, Burma, China, Indonesia, Formosa, Japan, Malaysia, New Guinea, New Zealand, Sri Lanka, Thailand.

Remarks: They are very common in the fish ponds and are voracious feeders on fish fingerlings. This species is cosmopolitan in distribution. It can be recognized by the presence of single segmented anterior tarsus and a spiny oblong patch on corium of wings.

5. *Lethocerus indicus* (Lepeletier and Serville): Plate 1: Fig.5

Material examined: 1♂, West Bengal: Murti River, infront of Murti Banani Bungalow, Jalpaiguri, 8.ix.2013, Coll: M. Chakrabarty.

Distribution: Burma, India, Java, Malay Peninsula, Pakistan, Philippines, Sumatra.

Remarks: Large species, body length ranges from 65-80mm. This species can be identified by the male genital segment with two strap-like respiratory appendages and the female genital segment broad with two protuberances. It is predaceous in nature, known to prey on fish fingerlings, snails and even frogs (Polhemus, 1982). It is also edible and used as a food in North-eastern India, Thailand and Vietnam. This species is reported from Murti River which is flowing across the Lataguri forested area of Jalpaiguri.

Family Notonectidae

6. *Enithares mandalayensis* Distant: Plate 1: Fig.6

Material examined: 1♀, West Bengal: Stream in front of Chapramari Wildlife Sanctuary, Jalpaiguri, 18.iii. 2012, Coll: S. Basu.

Distribution: India, Burma, Thailand, Malaysia, Vietnam.

Remarks: This species is a new record for the State of West Bengal and earlier it was reported from Assam (Thirumalai, 2007). It is identified by its small, robust and dark body colour and by the presence of a pale transverse band medially on pronotum and with the wide synthlipsis, which is less than half the width of pronotum. It was collected from a slow flowing stream across Chapramari Wildlife Sanctuary.

7. *Enithares unicata* Lundblad: Plate 1: Fig.7

Material examined: 2♀, West Bengal: Pond within Chapramari Wildlife Sanctuary, Jalpaiguri, 17.iii.2012, Coll: S. Basu.

Distribution: Sumatra, Java, India.

Remarks: Small pale species. They can be recognized by the presence of black stripe in the vertex along the inner margin against the eyes. This species is a new record for India. It is reported from a pond situated in the Chapramari Wildlife Sanctuary.

8. *Anisops breddini* Kirkaldy: Plate 1: Fig.8

Material examined: 4♂, 7♀, 10nymphs, West Bengal: Pond near Baradighi, Malbazar, Jalpaiguri, 17.ix. 2011, Coll: S. Basu; 4♂, 4♀, 1nymph, West Bengal: Pond within Chapramari WLS, Jalpaiguri, 17.iii.2012, Coll: S. Basu.

Distribution: Sri Lanka, Indochina, Java, Sulawesi, Malaysia (Kedah, Melaka, Johor), Singapore, India.

Remarks: A widespread species in India. This is reported from Chapramari WLS of Jalpaiguri Dist. It can be identified by the pale body colour with the elytra pale grayish and by the holoptic eyes.

9. *Anisops nasutus* Fieber: Plate 1: Fig. 9

Material examined: 14♂, 6♀, West Bengal: Wetland beside Gajaldoba Teesta Barrage, Jalpaiguri, 12.iii.2011, Coll: S. Basu.

Distribution: India, Australia, Celebes, New Guinea, Guam.

Remarks: This species is closely related to *A. batillifrons* Lundblad and can be differentiated by the frons produced anteriorly into a cephalic horn, apex of which with a median depression. They are abundant in the pond with aquatic vegetation.

10. *Anisops sardeus sardeus* Herrich- Shäffer: Plate 1: Fig.10

Material examined: 1♂, 1♀, West Bengal: Pond near Domohoni, Jalapaiguri, 23.ix.2012, Coll: M. Chakrabarty.

Distribution: India, Turkey, Syria, Albania, Africa, Corfu, Canary Islands, Afghanistan, Myanmar.

Remarks: This species can be differentiated by the presence of marginal row of prominent setae on the inner surface of fore tibia of male and presence of narrow synthlipsis. They are mostly confined to polluted stagnant pond.

11. *Anisops paranigrolineatus* Brooks: Plate 1: Fig.11

Material examined: 1♀, West Bengal: Jayanti forest Bungalow, Jalpaiguri, 6.iii.2011, Coll: S. Basu; 1♀, West Bengal: Jayanti River, Alipurduar, 6.iii.2011, Coll: S. Basu.

Distribution: India.

Remarks: Fusiform dark coloured species. The identifying features are the presence of wide synthlipsis and rostral prong shorter than third rostral segment. This species was reported from Jayanti forest of Terai-Dooars region.

12. *Nychia sappho* Kirkaldy: Plate 1: Fig.12

Material examined: 1♂, 5♀, West Bengal: Sikhiajhora, Alipurduar, 17.iv.2013, Coll: S. Basu.

Distribution: India, Australia, Indonesia, Malaysia, New Guinea, Sri Lanka, Africa.

Remarks: This genus is known from only a few poorly described species in India.

Plate 1



Plate 1: Figs. 1-12. Dorsal view of species: 1. *Sigara (Tropocorixa) promontoria* (Distant); 2. *Sigara (Vermicorixa) kemp* (Hutchinson); 3. *Diplonychus annulatus* (Fabricius); 4. *Diplonychus rusticus* (Fabricius); 5. *Lethocerus indicus* (Lepeletier and Serville); 6. *Enithares mandalayensis* Distant; 7. *Enithares unicata* Lundblad; 8. *Anisops breddini* Kirkaldy; 9. *Anisops nasutus* Fieber; 10. *Anisops sardeus sardeus* Herrich- Schäffer; 11. *Anisops paranigrolineatus* Brooks; 12. *Nychia sappho* Kirkaldy

Plate 2

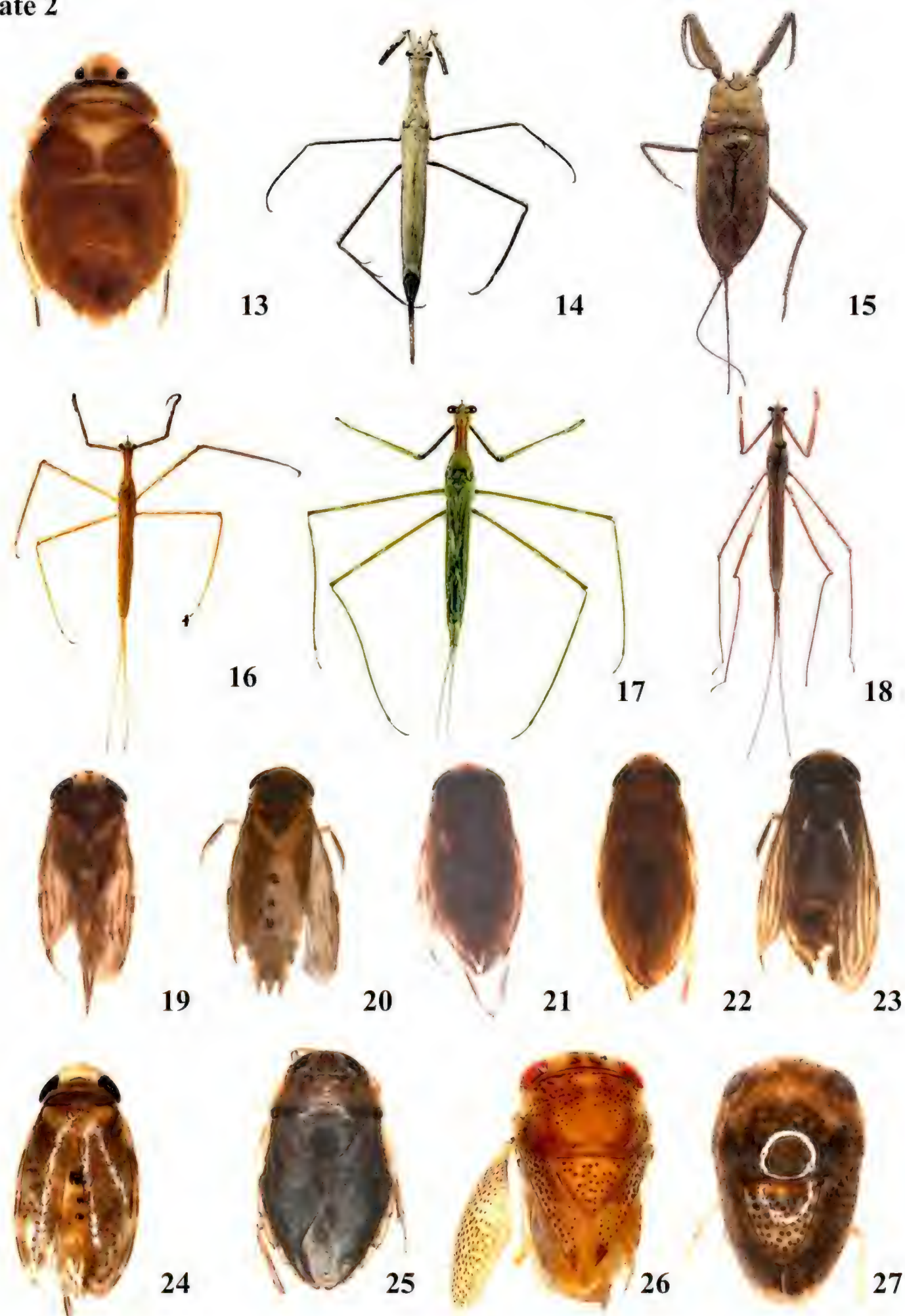


Plate 2: Figs. 13-27. Dorsal view of species: 13. *Aphelocheirus thirumalaii* Basu, Subramanian and Saha; 14. *Cercotmetus pilipes* (Dallas); 15. *Laccotrephes griseus* (Guerin-Meneville); 16. *Ranatra varipes varipes* Stal; 17. *Ranatra digitata* Hafiz and Pradhan; 18. *Ranatra filiformis* Fabricius; 19. *Micronecta (Basilionecta) quadristrigata* Breddin; 20. *Micronecta (Basilionecta) scutellaris scutellaris* (Stal); 21. *Micronecta desertana desertana* Distant; 22. *Micronecta khasiensis* Hutchinson; 23. *Micronecta ludibunda ludibunda* Breddin; 24. *Micronecta haliploides* Horvath; 25. *Heleocoris bengalensis bengalensis* Montandon; 26. *Paraplea frontalis* (Fieber); 27. *Tiphotrephes indicus* (Distant)

They are abundant in the fishing ponds and are predatory in nature. This species can be identified by the holoptic eyes, which is united basally.

Family Aphelocheiridae

13. *Aphelocheirus thirumalaii* Basu, Subramanian and Saha: Plate 2: Fig.13

Material examined: 5♂, 11♀, West Bengal: Dhupjhora, Murti River, within the Gorumara NP., Jalpaiguri, 17.iii.2012, Coll: S. Basu.

Distribution: India.

Remarks: This species was described by the authors Basu, Subramanian and Saha, (2013) from Gorumara NP of Jalpaiguri District. They can be differentiated from all the known species of the nominotypical subgenus by its relatively small, slender, and dark brown appearance and the characters of the male's parameres and the female's subgenital plate.

Family Nepidae

14. *Cercotmetus pilipes* (Dallas): Plate 2: Fig.14

Material examined: 2♂, West Bengal: Pond near Baradighi, Mal Bazar, Jalpaiguri, 17.ix.2011, Coll: S. Basu.

Distribution: India, Bhutan.

Remarks: This species was found in fish-ponds and is predatory in nature.

15. *Laccotrephes griseus* (Guerin-Meneville): Plate 2: Fig. 15

Material examined: 2♂, 2♀, West Bengal: Dima River, Damanpur forest, Jalpaiguri, 17.iv.2013, Coll: S. Basu; 2♂, West Bengal: Murti River, Chalsa, Jalpaiguri, 9.iii.2011, Coll: S. Basu; 1♀, West Bengal: Murti River, in front of Murti Banani Bungalow, Jalpaiguri, 9.iii.2011, Coll: S. Basu; 6♂, 6♀, West Bengal: Poro River, Poro beat, Chilapata forest Range, Jalpaiguri, 19.iv.2013, Coll: S. Basu.

Distribution: Malaysia, Myanmar, Seychelles, Sri Lanka, Japan, Thailand.

Remarks: This species is cosmopolitan in distribution. It is a sluggish species found often under weeds or at the bottom of slow flowing or stagnant water or edges of water body. They can be recognized by the acute

process on the prosternum and relatively small size than other species. Male paramere is slightly hooked and typical for the species.

16. *Ranatra varipes varipes* Stal: Plate 2: Fig.16

Materials examined: 1♂, West Bengal: Murti River, in front of Murti Banani Bungalow, Jalpaiguri, 16.iii.2013, Coll: S. Basu; 1♂, 2♀, 1 nymph, West Bengal: Pond at Mainaguri, Jalpaiguri, 3.x.2013, Coll: S. Basu; 1♂, 1♀, West Bengal: Teesta canal near Odlabari, Jalpaiguri, 19.iii.2012, Coll: S. Basu.

Distribution: India, Australia, Indonesia, Malaysia, Myanmar, Taiwan, Sri Lanka, Thailand.

Remarks: This species is cosmopolitan in distribution. It is mostly found among aquatic vegetation bordering the shallower parts of water bodies. It can be recognized by the antennal segments with many stout spines, distributed mainly in second and third antennal segments and hatchet shaped male paramere.

17. *Ranatra digitata* Hafiz and Pradhan: Plate 2: Fig.17

Material examined: 1♀, West Bengal: Murti River, Medla camp, Gorumara NP, Jalpaiguri, 17.iii.2012, Coll: S. Basu; 1♂, 3♀, West Bengal: Pond near Rhino camp, Gorumara NP., Jalpaiguri, 17.iii.2012, Coll: S. Basu.

Distribution: Burma, India.

Remarks: This species is widespread in stagnant ecosystems of West Bengal and mostly found in fish ponds. This can be distinguished by anterior lobe much darker than and slightly less than twice as long as posterior lobe and by the metasternum which is flat, basally triangular, lateral margins concave.

18. *Ranatra filiformis* Fabricius: Plate 2: Fig.18

Material examined: 1♂, 2♀, Murti River, in front of Murti Banani Bungalow, Jalpaiguri, 8.xi.2013, Coll: S. Basu; 1♂, 2♀, West Bengal: Pond at Binnaguri, Jalpaiguri, 3.x.2013, Coll: S. Basu; 1♀, West Bengal: Pond near Rhino camp, Gorumara NP, Jalpaiguri, 17.iii.2012, Coll: S. Basu.

Distribution: India, Burma, Nepal, Pakistan, Philippines, Sri Lanka.

Remarks: This is one of the smaller and slender species and can be distinguished by the male paramere which is distally hook-like and with several stout spines on its inner margin. It is widespread in India. This species was reported from the river or pond within forested area.

Family Micronectidae

19. *Micronecta (Basilionecta) quadristrigata* Breddin: Plate 2: Fig.19

Material examined: 2♂, 3♀, West Bengal: Wetland beside Gajaldoba Teesta barrage, Jalapiguri, 12.iii. 2011, Coll: S. Basu.

Distribution: India, Sri Lanka, South east Asia, Hong Kong, Taiwan, Indonesia, Philippines, Australia, Malaysia, Singapore.

Remarks: A widespread species. Very common and found abundantly in light trap. This species can be identified by the hemelytra with broken longitudinal stripes and lateral margins of hemelytra with four dark patches.

20. *Micronecta (Basilionecta) scutellaris scutellaris* (Stal): Plate 2: Fig.20

Material examined: 9♂, 1nymph, West Bengal: Pond near Baradighi, Mal Bazar, Jalpaiguri, 17.ix. 2011, Coll: S. Basu; 1♂, 3♀, West Bengal: Raidhak River, Alipurduar, 19.iv.2013, Coll: S. Basu; 3♂, 7♀, West Bengal: Wetland beside Gajaldoba Teesta barrage, Jalpaiguri, 2.iii.2011, Coll: S. Basu.

Distribution: Africa, Arabia, India, Sri Lanka, Southeast Asia, China, Malaysia, Johor, Melaka, Singapore.

Remarks: This is the largest species of *Micronecta* (upto 4mm) and very widespread in India and other countries. They can be identified by the hemelytra with dark longitudinal stripes which may vary from distinct unbroken to broken stripes.

21. *Micronecta desertana desertana* Distant: Plate 2: Fig.21

Material examined: 2♂, 7♀, West Bengal: Kalikhola, Jalpaiguri, 17.iii.2013, Coll: S. Basu

Distribution: India, Iran, United Arab Emirates and Oriental Region.

Remarks: This species is a new report for West Bengal. It can be differentiated by the

pale yellow head with an obscure central orange spot on the vertex and by the male paramere.

22. *Micronecta khasiensis* Hutchinson: Plate 2: Fig.22

Material examined: 1♀, West Bengal: Jayanti River, Alipurduar, 6.iii.2011, Coll: S. Basu.

Distribution: India, Vietnam.

Remarks: Dark yellowish orange to brown species with sparse pale pubescence on elytra. This was collected from the slow flowing Jayanti River across Jayanti forest, under Buxa Tiger Reserve.

23. *Micronecta ludibunda ludibunda* Breddin: Plate 2: Fig.23

Material examined: 1♂, 3♀, West Bengal: Wetland within Chapramari WLS, Jalpaiguri, 17.iii.2012, Coll: S. Basu.

Distribution: India, Sri Lanka, South East Asia, Indonesia, New Guinea, Solomon Islands, Malaysia, Singapore.

Remarks: A medium sized dark brown coloured species with distinct stripes on the hemelytra. This species is a new record for West Bengal. It is widespread throughout the World. It was reported from Chapramari forest.

24. *Micronecta haliploides* Horvath: Plate 2: Fig.24

Material examined: 1♂, West Bengal: Mujnai River, Madarihat, Jalpaiguri, 18.iii.2013, Coll: S. Basu.

Distribution: India, Sri Lanka, Southeast Asia, Sumatra, Java, Bali, Singapore, Thailand, Johor, Melaka, Sembilan, Penang.

Remarks: This is a widespread species. This species can be collected using light trap. They can be distinguished by the yellowish hemelytra marked with distinct dark dots.

Family Naucoridae

25. *Heleocoris bengalensis bengalensis* Montandon: Plate 2: Fig. 25

Material examined: 2♂, 4♀, West Bengal: Dhupjhora, Jalpaiguri, 17.iii.2012, Coll: S. Basu; 11♂, 13♀, 6nymphs, West Bengal: Dhupjhora, within Gorumara NP., Jalpaiguri, 17.iii.2012, Coll: S. Basu; 1♀, 1nymph, West

Bengal: Murti River, Medla camp, Gorumara NP., Jalpaiguri, 17.iii.2012, Coll: S. Basu.

Distribution: India, Southeast Asia, Sumatra, Java, Sri Lanka.

Remarks: This species was collected from Murti River flowing across Gorumara NP of WB. This species can be identified by the metaxyphus which is typical for the species and by the male genital capsule.

Family Pleidae

26. *Paraplea frontalis* (Fieber): Plate 2: Fig.26

Material examined: 2♂, 3♀, West Bengal: Pond near Baradighi, Mal Bazar, Jalpaiguri, 17.ix.2011, Coll: S. Basu.

Distribution: Burma, Sumatra, Java, Sri Lanka, Southeast Asia, Taiwan, Singapore, Thailand, Malaysia.

Remarks: They are predators, feeding on mosquito larvae, small crustaceans and water fleas etc. They are very minute bugs with three prominent keels on abdominal sternites.

Family Helotrephidae

27. *Tiphotrephes indicus* (Distant): Plate 2: Fig.27

Material examined: 2exs, West Bengal: Sikhiakhora, Alipurduar, 8.iii.2011, Coll: S. Basu.

Distribution: India, Indonesia, Malaysia, Myanmar, Singapore and Thailand.

Remarks: This species was reported from Sikhiakhora forest, which is located within Buxa Tiger Reserve range. It can be distinguished by small oval body, dorsally distinctly punctate and body highly emarginated anteriorly than posteriorly.

Infraorder Gerromorpha Popov

Family Gerridae

28. *Amemboa bifurcata* Basu, Subramanian and Polhemus: Plate 3: Fig.28

Material examined: 5♂, 10♀, 4nymphs, West Bengal: Kalikhola, stream flowing between Chapramari WLS and Gorumara NP, Jalpaiguri, 17.iii.2013, coll. S. Basu; 2♂, West Bengal: Chilapata forest, Bania River, Jalpaiguri, 19.iv.2013, coll. S. Basu.

Distribution: India.

Remarks: This species was newly described in the year 2014 from forested zone of

Terai- Dooars (Basu *et al.*, 2014). This species can be distinguished by the bifurcated lateral projection of pygophore and proctiger and by the male fore leg.

29. *Amemboa mahananda* Basu, Subramanian and Polhemus: Fig.29

Material examined: 9♂, 3♀, West Bengal: Mahananda WLS, stagnant pool, Darjeeling, 20.iii.2012, Coll: S. Basu; 5♂, 3♀, 2nymphs, West Bengal: Mahananda WLS, Panchanoi River, Darjeeling, 20.iii.2012, Coll: S. Basu.

Distribution: India.

Remarks: This was newly described from Mahananda WLS of the Terai-Dooars region (Basu *et al.*, 2014). This species can be identified by the distinct three patches on male fore leg.

30. *Amemboa kumari* (Distant): Plate 3: Fig.30

Material examined: 2♀, West Bengal: Sikhiakhora, Alipurduar, 8.iii.2011, Coll: S. Basu.

Distribution: India.

Remarks: This species is a new record to the State of West Bengal and can be differentiated by the distinct male and female genital structure.

31. *Ptilomera (Proptilomera) himalayensis* Hungerford and Matsuda: Plate 3: Fig.31

Material examined: 1♂, 1♀, West Bengal: Buxa Jhora, near Buxa fort, Buxa Tiger Reserve Forest, Jalapiguri, 19.iv.2013, Coll: S. Basu; 1♂, 1♀, West Bengal: Gourjanjhora, near Mal Bazar, Jalpaiguri, 1.x.2013, Coll: S. Basu.

Distribution: India.

Remarks: They are best fitted for survival in the torrential streams during the entire monsoon. The members of this species can be distinguishable from other *Ptilomera* species by the absence of metacoxal spine.

32. *Ptilomera (Ptilomera) laticaudata* (Hardwicke): Plate 3: Fig.32

Material examined: 1♂, 3nymphs, West Bengal: Bajekhola, Jayanti forest, Buxa Tiger Reserve, Jalpaiguri, 19.iv.2013, Coll: S. Basu; 1♂, West Bengal: Buri Torsha riverside,

South Khairabari Reserve Forest, Jalpaiguri, 19.iii.2013, Coll: S. Basu; 1♂, 3♀, West Bengal: Chel River, Gorubathan, Darjeeling, 1.x.2013, Coll: S. Basu; 1♂, 3♀, West Bengal: Chel River, near Ranichera tea garden, Malbazar, Jalpaiguri, 19.iii.2012, Coll: S. Basu; 1♂, 1♀, 2nymphs, West Bengal: Jhora near Bagrakote tea garden, Jalpaiguri, 11.ix.2011, Coll: S. Basu; 2♂, West Bengal: Jhora near Chilapata forest, Mendabari beat, Jalpaiguri, 18.iv.2013, Coll: S. Basu; 1♂, 2nymphs, West Bengal: Kalikhola, between Gorumara and Chapramari WLS, Jalpaiguri, 17.iii.2013, Coll: S. Basu; 1♂, 1♀, West Bengal: Mal River, Mal Bazar, Jalpaiguri, 11.ix.2011, Coll: S. Basu; 3♂, 1♀, 3nymphs, West Bengal: Murti River, near Murti rail bridge, Jalpaiguri, 17.iii.2013, Coll: S. Basu; 2♂, 1♀, 8nymphs, West Bengal: Murti River, Samsing, Jalpaiguri, 9.xi. 2013, Coll: M. Chakrabarty; 1♂, 1♀, 1nymph, West Bengal: Neora River, near rail bridge, Jalpaiguri, 17.iii.2013, Coll: S. Basu; 2♂, 3♀, 4nymphs, West Bengal: Raimatang River, Raimatang, Buxa Tiger Reserve range, Jalpaiguri, 20.iv.2013, Coll: S. Basu.

Distribution: Nepal, India.

Remarks: This species is found in the lotic ecosystems of Terai- Dooars region of Bengal. It is a successful survivor in the high altitudinal cascades. They are very similar to *Ptilomera assamensis*, but can be distinguished by male paramere and genital segment.

33. *Ptilomera (Ptilomera) assamensis* Hungerford and Matsuda: Plate 3: Fig.33

Material examined: 1♂, 1♀, West Bengal: Bajekhol, Jayanti forest, Buxa Tiger Reserve forest, Jalpaiguri, 19.iv.2013, Coll: S. Basu; 2♀, 4nymphs, West Bengal: Chel River, Gorubathan, Darjeeling, 1.x.2013, Coll: S. Basu; 1♂, 3nymphs, West Bengal: Stream near Chilapata forest, Mendabari beat, Jalpaiguri, 18.iv.2013, Coll: S. Basu; 1♂, 1♀, 1nymph, West Bengal: Stream in front of Chapramari rail gate, Jalpaiguri, 10.iii.2011, Coll: S. Basu; 1♂, 1♀, West Bengal: Murti River, near Murti rail bridge, Jalpaiguri, 17.iii.2013, Coll: S. Basu; 1♂, 6♀, West Bengal: Murti River, on the way to Chalsa, Jalpaiguri, 24.ix.2012, Coll: S. Basu; 2♂, 1nymph, West Bengal: Sukhahjhora, Mal Bazar, Jalpaiguri, 11.ix.2011, Coll: S. Basu.

Distribution: India.

Remarks: This species is closely related to *Ptilomera (Ptilomera) laticaudata* (Hardwicke) and can be differentiated by the male pygophore and proctiger which are broad and surpassing the lateral wings caudally. They are very common species found in this region.

34. *Heterobates rihandi* (Pradhan): Plate 3: Fig.34

Material examined: 5♂, 4♀, West Bengal: Dhupjhora, Gachbari, Murti River, Jalpaiguri, 17.iii.2012, Coll: S. Basu; 1♂, 3♀, 1nymph, West Bengal: Dhupjhora, Murti River, Within Gorumara NP, Jalpaiguri, 17.iii.2012, Coll: S. Basu; 4♂, 5♀, 3nymphs, West Bengal: Jaldhaka River, Nagrakata, Jalpaiguri, 17.iii.2013, Coll: S. Basu; 10♂, 2♀, 21 nymphs, West Bengal: Mahananda River, within Mahananda WLS, Darjeeling, 20.iii.2012, Coll: S. Basu; 2♂, West Bengal: Mal River, Jalpaiguri, 11.ix.2011, Coll: S. Basu; 4♂, 5♀, 3nymphs, West Bengal: Murti River, Chalsa, Jalpaiguri, 9.iii.2011, Coll: S. Basu; 3♂, 3♀, West Bengal: Murti River, in front of Murti Banani Bungalow, Jalpaiguri, 10.iii. 2011, Coll: S. Basu; 4♀, West Bengal: Murti River, Medla camp, Gorumara NP, Jalpaiguri, 17.iii.2012, Coll: S. Basu; 1♂, 1♀, West Bengal: Sukhahjhora near Mal Bazar, Jalpaiguri, 11.ix.2011, Coll: S. Basu.

Distribution: India

Remarks: This species is a new record for the State of West Bengal. It is well-distributed in the riffles and streams of Terai- Dooars region. They can be identified by the first antennal segment much longer than the other three segments together and black pronotum with an inverted “T” shaped yellowish brown margin touching posterior margin.

35. *Pleciobates bengalensis* Jehamalar, Basu and Zettel: Plate 3: Fig.35

Material examined: 15♂, 1♀, West Bengal: Raidak River, Alipurduar, 19.iv.2013, Coll: S. Basu; 2♀, West Bengal: Dima River, Buxa Tiger Reserve, Damanpur Forest, Jalpaiguri, 17.iv.2013, Coll: S. Basu; 4♂, 1♀, West Bengal: Sikhiajhora stream, Alipurduar, 17.iv. 2013, Coll: S. Basu.

Distribution: India

Remarks: This is a new species described in 2014 from this region (Jehamalar *et al.*, 2014). It can be distinguished by a prominent silvery white fascia on each side of the sublateral region of the mesonotum and by the male endosomal sclerite.

36. *Chimarrhometra orientalis* Distant: Plate 3: Fig. 36

Material examined: 2♂, 3♀, West Bengal: Buxa Jhora, near Buxa fort, Buxa Tiger Reserve, Jalpaiguri, 19.iv.2013, Coll: S. Basu; 1♂, 1♀, West Bengal: Jhora near Gorubathan, Darjeeling, 1.x.2013, Coll: S. Basu.

Distribution: Pakistan, India.

Remarks: This species is mostly found in the shallow edges of streams or between rocks in the streams. It can be easily identified by its modified male genital segment, which is typical for that species.

37. *Onychotrechus dooarsicus* Subramanian, Basu and Zettel: Plate 3: Fig.37

Material examined: 2♂, 1♀, West Bengal: Buxa Jhora near Buxa fort; Buxa Tiger Reserve, Jalpaiguri, 19.iv.2013, Coll: S. Basu.

Distribution: India

Remarks: This was recently described from the Buxa Tiger Reserve of Dooars region (Subramanian *et al.*, 2014). It can be differentiated by the male fore tibia, which bears a patch of few short hairs basally on flexor side and a soft spinous structure protruding outwards from the base of the curvature.

38. *Gerris (Gerris) nepalensis* Distant: Plate 3: Fig.38

Material examined: 1♂, 2♀, 4nymphs, West Bengal: Kalipur Wetland, within Gorumara NP, Jalpaiguri, 17.iii.2012, Coll: S. Basu; 1♂, West Bengal: Sikhiajhora, Jalpaiguri, 17.iv.2013, Coll: S. Basu.

Distribution: Nepal, China, Japan, Korea, East of Russia.

Remarks: This species is dorsally black with a curved yellow marking on head. It is reported from Gorumara NP and Sikhiajhora forest of Buxa Tiger Reserve.

39. *Aquarius adalaides* (Dohrn): Plate 3: Fig.39

Material examined: 1♂, 2♀, West Bengal: Dima River, Damanpur forest, Jalpaiguri, 17.iv.2013, Coll: S. Basu; 2♂, 3nymphs, West Bengal: Pond near Rhino camp, Gorumara NP, Jalpaiguri, 17.iii.2012, Coll: S. Basu; 5♂, 7♀, West Bengal: Sikhiajhora, Jalpaiguri, 17.iv.2013, Coll: S. Basu; 3♀, 1nymph, West Bengal: Small jhora within Gorumara NP, Jalpaiguri, 17.iii.2012, Coll: S. Basu.

Distribution: Australia, Burma, China, Java, Malacca, Philippines, Sumatra, Thailand, India.

Remarks: This species is widely distributed in the lentic ecosystems like ponds or lakes of this region. It can be identified by long and stout connexival spines almost reaching abdominal end in male.

40. *Aquarius paludum* (Fabricius): Plate 3: Fig.40

Material examined: 1♂, 2 nymphs, West Bengal: Dhupjhora, near Murti River, Jalpaiguri, 10.ix.2011, Coll: S. Basu.

Distribution: Burma, Thailand, Vietnam, Denmark, France, Iran, Japan, China, Jordan.

Remarks: This species is closely related to *A. adalaides* (Dohrn), but can be distinguished by the male connexival spines which is long and slightly surpassing the abdominal end.

41. *Neogerris parvulus* (Stal): Plate 3: Fig. 41

Material examined: 4♂, 5♀, West Bengal: Bania River, Chilapata forest, Jalpaiguri, 19.iv.2013, Coll: S. Basu; 1♂, 2♀, West Bengal: Buri Torsha River, Bish Khutia, between South Khairabari and North Khairabari Reserve forest, Jalpaiguri, 19.iii.2013, Coll: S. Basu; 1♂, 2♀, West Bengal: Buri Torsha Riverside, South Khairabari Reserve Forest, Jalpaiguri, 19.iii.2013, Coll: S. Basu; 1♂, 1♀, 2nymphs, West Bengal: Dima River, Damanpur forest, Buxa Tiger Reserve, Jalpaiguri, 17.iv.2013, Coll: S. Basu; 1♂, West Bengal: Jayanti Forest Bungalow, Jalpaiguri, 6.iii.2011, Coll: S. Basu; 1♂, 1♀, West Bengal: Jayanti River, Alipurduar, 6.iii.2011, Coll: S. Basu; 5♂,

Plate 3

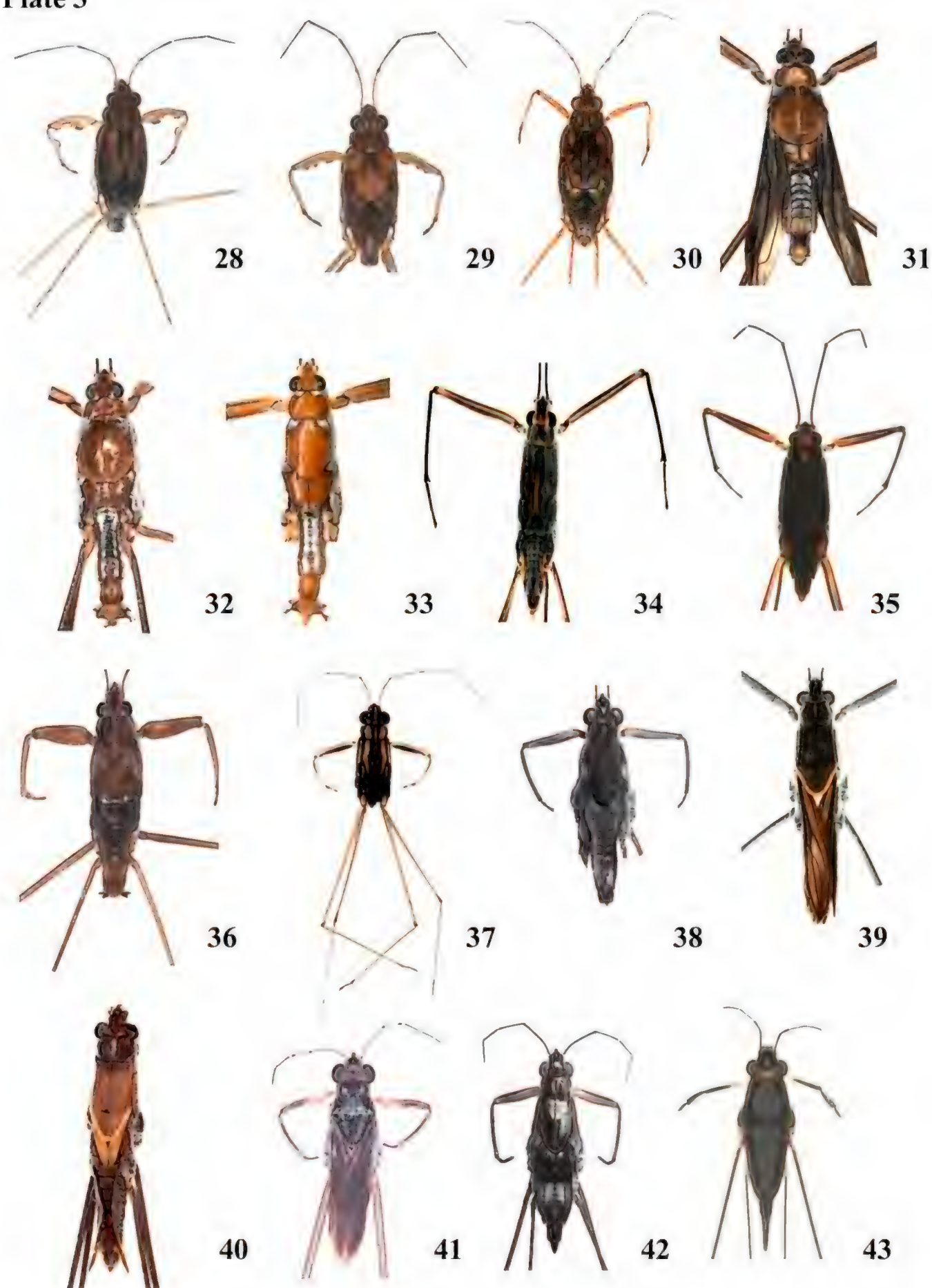


Plate 3: Figs. 28-43. Dorsal view of species: 28. *Amemboa bifurcata* Basu, Subramanian and Polhemus; 29. *Amemboa mahananda* Basu, Subramanian and Polhemus; 30. *Amemboa kumari* (Distant); 31. *Ptilomera (Proptilomera) himalayensis* Hungerford and Matsuda; 32. *Ptilomera (Ptilomera) laticaudata* (Hardwicke); 33. *Ptilomera (Ptilomera) assamensis* Hungerford and Matsuda; 34. *Heterobates rihandi* (Pradhan); 35. *Pleciobates bengalensis* Jehamalar, Basu and Zettel; 36. *Chimarrhometra orientalis* Distant; 37. *Onychotrechus dooarsicus* Subramanian, Basu and Zettel; 38. *Gerris (Gerris) nepalensis* Distant; 39. *Aquarius adelaides* (Dohrn); 40. *Aquarius paludum* (Fabricius); 41. *Neogerris parvulus* (Stal); 42. *Limnogonus (Limnogonus) fossarum fossarum* (Fabricius); 43. *Rhagadotarsus (Rhagadotarsus) kraepelini* Breddin

Plate 4

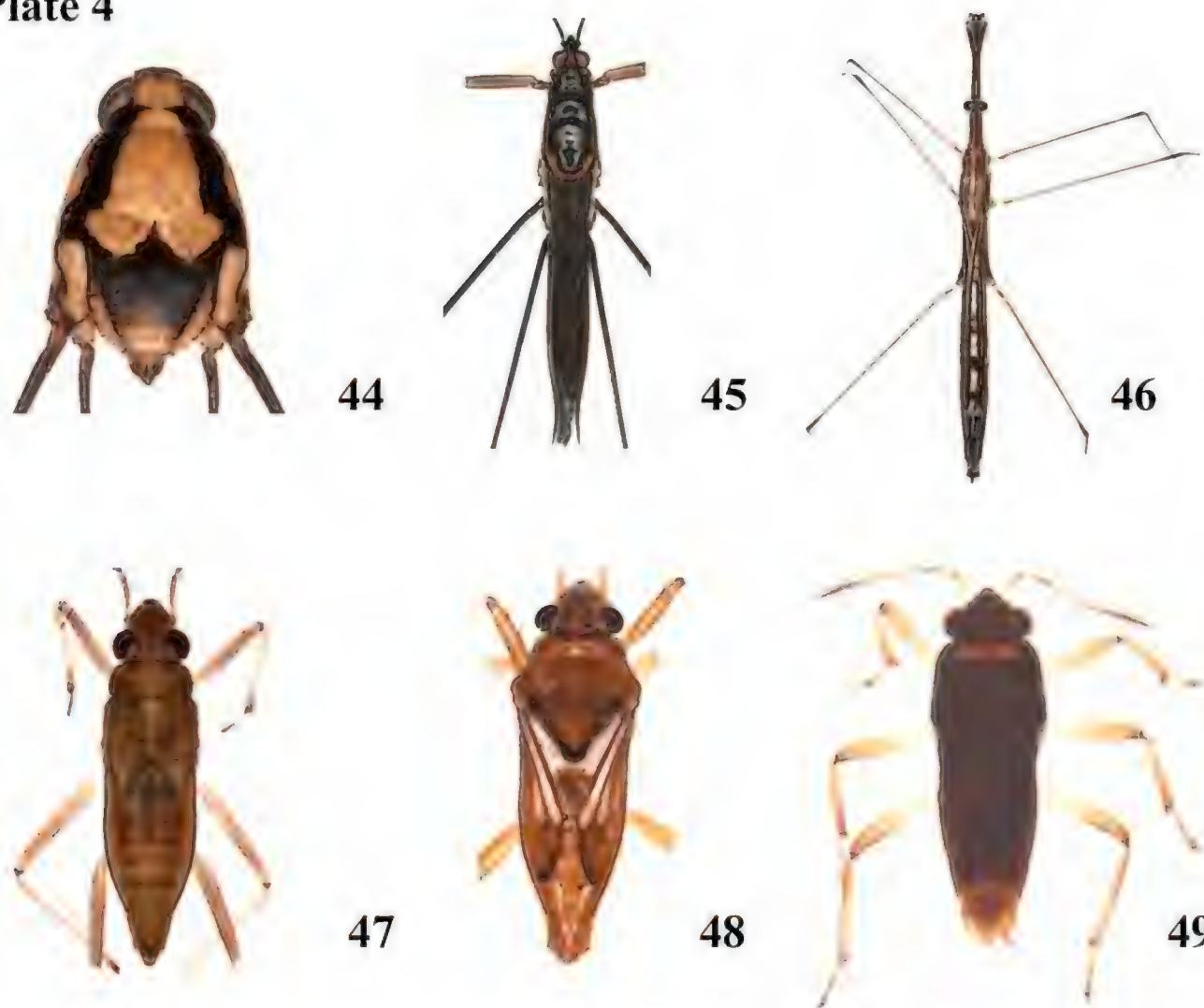


Plate 4: Figs. 44-49. Dorsal view of species: 44. *Ventidius (Ventidius) sushmae* Gupta; 45. *Cylindrostethus productus* (Spinola); 46. *Hydrometra greeni* Kirkaldy; 47. *Mesovelgia vittigera* Horváth; 48. *Mesovelgia horvathi* Lundblad; 49. *Microvelia (Microvelia) douglasi* Scott

6♀, West Bengal: Kalikhola, between Gorumara and Chapramari forest, Jalpaiguri, 17.iii. 2013, Coll: S. Basu; 8♂, 5♀, West Bengal: Kalipur wetland, within Gorumara N Park, Jalpaiguri, 17.iii.2012, Coll: S. Basu; 10♂, 14♀, West Bengal: Sikhiajhora, Jalpaiguri, 17.iv.2013, Coll: S. Basu; 5♂, 4♀, 5nymphs, West Bengal: Teesta canal, near Odlabari, Jalpaiguri, 19.iii.2012, Coll: S. Basu; 3♂, 2♀, West Bengal: Wetland beside Gajaldoba Teesta barrage, Jalpaiguri, 12.iii.2011, Coll: S. Basu; 1♂, 3nymphs, West Bengal: Wetland within Chapramari WLS, Jalpaiguri, 17.iii.2012, Coll: S. Basu.

Distribution: India, Burma, Oman, Iran, Thailand, Vietnam, Malay Peninsula, China, Taiwan, Java, Philippine, Solomon Island, New Guinea.

Remarks: This is a widespread species. This species can be caught easily by light trap. It can be identified by the yellowish round spot on its black pronotum.

42. *Limnogonus (Limnogonus) fossarum fossarum* (Fabricius): Plate 3: Fig.42

Material examined: 1♂, 1♀, West Bengal: Buri Torsha River, Bish Khutia, border between South Khairabari and North Khairabari Reserve forest, Jalpaiguri, 19.iii.2011, Coll: S. Basu; 5♂, 3♀, 14nymphs, West Bengal: Kalipur wetland, within Gorumara NP, Jalpaiguri, 17.iii.2012, Coll: S. Basu; 1♂, 1♀, West Bengal: Pond near Domohoni, Jalpaiguri, 23.ix.2012, Coll: M. Chakrabarty; 1♀, West Bengal: Poro River, Poro beat, Chilapata forest range, 19.iv.2013, Coll: S. Basu; 5♂, 5♀, 1nymph, West Bengal: Sikhiajhora, Jalpaiguri, 17.iv.2013, Coll: S. Basu; 1♀, West Bengal: Teesta Canal, near Odlabari, Jalpaiguri, 19.iii.2012, Coll: S. Basu; 4♂, 13nymphs, West Bengal: Wetland beside Gajaldoba Teesta barrage, Jalpaiguri, 13.iii.2011, Coll: S. Basu.

Distribution: Burma, India, Thailand, Laos, Vietnam, China, Macao, Hong Kong, Hainan, Amoy, Singapore, Sumatra, Philippine, Taiwan, Borneo.

Remarks: This species is widespread globally and very common in Terai- Dooars region of Bengal. This can be distinguished by the long yellowish stripe on pronotum reaching up to posterior margin of pronotum.

43. *Rhagadotarsus (Rhagadotarsus) kraepelini* Breddin: Plate 3: Fig.43

Material examined: 2♂, West Bengal: Sikhiajhora, Jalpaiguri, 17.iv.2013, Coll: S. Basu.

Distribution: Malaysia, Singapore, Java, Indonesia, Sri Lanka, Thailand, Vietnam, China, Myanmar, Taiwan, India.

Remarks: This species is widespread. But, it was collected from only one locality of Terai- Dooars region. They can be identified by their small size and black colour and by the abdominal tergite which is narrowly elongated.

44. *Ventidius (Ventidius) sushmae* Gupta: Plate 4: Fig. 44

Material examined: 1♂, 4♀, 5nymphs, West Bengal: Sikhiajhora, Jalpaiguri, 8.iii.2011, Coll: S. Basu; 6♂, 15♀, West Bengal: Sikhiajhora, Jalpaiguri, 17.iv.2013, Coll: S. Basu.

Distribution: India.

Remarks: Yellowish to greenish species with black markings. They can be identified by the triangular median spot and a pair of black stripes in the head. This species is found in good numbers in the Sikhijhora forest of Buxa Tiger Reserve forest.

45. *Cylindrostethus productus* (Spinola): Plate 4: Fig.45

Material examined: 1♂, 2♀, West Bengal: Jhora in front of Chapramari WLS, Jalpaiguri, 18.iii.2012, Coll: S. Basu; 1♂, 1♀, West Bengal: Jhora in front of Chapramari rail gate, Jalpaiguri, 10.iii.2011, Coll: S. Basu; 3♀, West Bengal: Khunia more, Chapramari WLS, Jalpaiguri, 9.iii.2013, Coll: M. Chakrabarty; 5♂, 6♀, West Bengal: Small jhora within Gorumara NP, Jalpaiguri, 17.iii.2012, Coll: S. Basu.

Distribution: India, Sri Lanka, Nepal.

Remarks: Very large species, dark and elongated. It can be distinguished by a prominent vertical keel medially in the meso and metasternum. This species is abundant in two of the conservation areas namely, Gorumara

National Park and Chapramari WLS of this region.

Family Hydrometridae

46. *Hydrometra greeni* Kirkaldy: Plate 4: Fig.46

Material examined: 1♂, West Bengal: Buri Torsha River, Bish Khutia, border between South Khairabari and North Khairabari Reserve forest, Jalpaiguri, 19.iii.2013, Coll: S. Basu; 2♂, 1♀, West Bengal: Jayanti River, Jayanti forest Bungalow, Alipurduar, 6.iii.2011, Coll: S. Basu; 1♂, West Bengal: Jayanti River, Alipurduar, 6.iii.2011, Coll: S. Basu; 1♂, 2♀, West Bengal: Jhora in front of Chapramari WLS, Jalpaiguri, 18.iii.2012, Coll: S. Basu; 3♂, West Bengal: Jhora in front of Chapramari railgate, Jalpaiguri, 10.iii. 2011, Coll: S. Basu; 5♂, 3♀, West Bengal: Kalikhola, between Gorumara and Chapramari forest, Jalpaiguri, 17.iii.2013, Coll: S. Basu; 4♂, 4♀, West Bengal: Murti River, Chalsa, Jalpaiguri, 9.iii.2011, Coll: S. Basu; 2♀, West Bengal: Poro River, Poro beat, Chilapata forest range, Jalpaiguri, 19.iv.2013, Coll: S. Basu; 1♂, 1♀, West Bengal: Raidhak River, Alipurduar, 19.iv.2013, Coll: S. Basu; 2♀, West Bengal: Sikhiajhora, Jalpaiguri, 8.iii.2011, Coll: S. Basu; 3♂, 3♀, West Bengal: Small jhora within Gorumara NP, Jalpaiguri, 17.iii.2012, Coll: S. Basu; 2♂, 2♀, West Bengal: stagnant pool, North Khairabari Reserve forest, Jalpaiguri, 19.iii.2013, Coll: S. Basu; 10♂, 15♀, West Bengal: Stagnant pool within Mahananda WLS, Darjeeling, 20.iii. 2012, Coll: S. Basu; 1♂, West Bengal: Teesta canal, near Odlabari, Jalpaiguri, 19.iii. 2012, Coll: S. Basu; 1♀, West Bengal: Teesta canal, Teesta barrage, Gajaldoba, Jalpaiguri, 13.iii.2011, Coll: S Basu; 2♂, 2♀, West Bengal: Wetland beside Gajaldoba, Teesta barrage, Jalpaiguri, 13.iii.2011, Coll: S. Basu; 2♂, 2♀, West Bengal: Dima River, Damanpur forest, Jalpaiguri, 17.iv.2013, Coll: S. Basu.

Distribution: Bangladesh, China, Nepal, Sri Lanka, Sumatra, Thailand, Vietnam.

Remarks: A widespread species found throughout the World. This is very common in the aquatic ecosystems of this region and mostly found on the algal bloom. It can be distinguished by the male seventh sternite which is transversely depressed and hairy and by the long

slender brownish yellow body with a narrow white stripe extends midway of the body.

Family Mesoveliidae

47. *Mesovelia vittigera* Horváth: Plate 4: Fig. 47

Material examined: 2♂, 1♀, West Bengal: Buri Torsha River, Bish Khutia, border between South Khairabari and North Khairabari Reserve Forest, Jalpaiguri, 19.iii.2013, Coll: S. Basu; 1♂, West Bengal: Pond at Binnaguri, Jalpaiguri, 3.x.2013, Coll: S. Basu; 5♂, 3♀, West Bengal: Pond at Mainaguri, Jalpaiguri, 3.x.2013, Coll: S. Basu.

Distribution: Malaysia, Singapore, Africa, Australia, Egypt, Indonesia, Palestine, Philippines, Syria, Sri Lanka, Samoa Island, China, Japan, India.

Remarks: They are found in the lentic ecosystems mainly pond, lake, river bank within floating vegetation. This small greenish bug can be identified by the male genital segment which is with a stout black hair tufts on the middle and a pair of brush like hairs laterally.

48. *Mesovelia horvathi* Lundblad: Plate 4: Fig. 48

Material examined: 1♂, West Bengal: Pond near Baradighi, Mal Bazar, Jalpaiguri, 17.ix.2011, Coll: S. Basu.

Distribution: India, Indonesia, Malaysia, Sri Lanka, Thailand, Vietnam.

Remarks: They are small, slender, greenish bugs and carnivorous in nature. They can be identified by the male genital segment which is without median spine, but with lateral groups of brush-like hairs.

Family Veliidae

49. *Microvelia (Microvelia) douglasi* Scott: Plate 4: Fig.49

Material examined: 1♂, 2♀, West Bengal: Sikhiajhora, Jalpaiguri, 8.iii.2011, Coll: S. Basu; 1♀, West Bengal: Teesta canal near Odlabari, Jalpaiguri, 19.iii.2012, Coll: S. Basu; 12♀, 8♂, West Bengal: wetland beside Gajaldoba Teesta Barraige, Jalpaiguri, 12.iii.2012, Coll: S. Basu.

Distribution: India, Australia, Japan, Indonesia, Sri Lanka.

Remarks: This species is reported from the stagnant ecosystems of Terai region of West Bengal and can be easily identified with the structure of male genital segment. They can be identified by the male genital segment with one paramere extending outward.

Discussion

The present study documented a total of 49 species and 30 genera of aquatic and semi-aquatic Heteroptera from Terai- Dooars region of West Bengal. *Hydrometra greeni* Kirkaldy, *Neogerris parvulus* (Stal), *Heterobates rihandi* (Pradhan), *Ptilomera (Ptilomera) laticaudata* (Hardwicke), *Ptilomera (Ptilomera) assamensis* Hungerford and Matsuda, *Diplonychus annulatus* (Fabricius) are the more common species found in freshwater ecosystems like ponds, streams, rivers etc. The species *Enithares mandalayensis* Distant, *Aphelocheirus thirumalaii* Basu, Subramanian and Saha, *Ventidius (Ventidius) sushmae* Gupta, *Cylindrostethus productus* (Spinola), *Onychotrechus dooarsicus* Subramanian, Basu and Zettel, *Amemboa mahananda* Basu, Subramanian and Polhemus, *Amemboa kumari* (Distant), *Ptilomera (Proptilomera) himalayensis* Hungerford and Matsuda, *Pleciobates bengalensis* Jehamalar, Basu and Zettel, *Amemboa bifurcata* Basu, Subramanian and Polhemus, *Heleocoris bengalensis bengalensis* Montandon, *Micronecta ludibunda ludibunda* Breddin, *Micronecta khasiensis* Hutchinson are exclusively found in forest habitats. The species *Microvelia (Microvelia) douglasi* Scott, *Mesovelia vittigera* Horvath, *Mesovelia horvathi* Lundblad, *Hydrometra greeni* Kirkaldy, *Aquarius adelaides* (Dohrn), *Paraplea frontalis* (Fieber), *Micronecta (Basilionecta) scutellaris scutellaris* (Stal), *Ranatra varipes varipes* Stal, *Laccotrephes griseus* (Guerin-Meneville), *Anisops sardeus sardeus* Herrich- Shaffer, *Anisops breddini* Kirkaldy, *Diplonychus annulatus* (Fabricius) are reported from agricultural habitats. Three species collected from this region are new reports to the State of West Bengal.

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A taxonomic review of the genus *Parancistrocerus* Bequaert (Hymenoptera: Vespidae: Eumeninae) from the Indian subcontinent with the description of three new species

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Abstract

The potter wasp genus *Parancistrocerus* Bequaert, 1925, is reviewed from the Indian subcontinent. Three new species, namely, *Parancistrocerus jaferpaloti* Girish Kumar and Carpenter sp. n., *P. loharbandensis* Girish Kumar and Carpenter sp. n. and *P. turensis* Girish Kumar and Carpenter sp. n. are described. The species *P. holzschuhi* Gusenleitner, 1987, is recorded here for the first time from India. The male of *P. vicinus* Giordani Soika, 1994, is described. *Parancistrocerus intermediatus* (Sonan, 1939), *P. nitobei* (Sonan, 1939), *P. kuraruensis* (Sonan, 1939) and *P. taikonus* (Sonan, 1939) are new combinations. A key to species and subspecies from the Indian subcontinent and an updated checklist of Oriental species are also provided.

Keywords: *Parancistrocerus*, new species, key, checklist, new combination, new record, India, Indian subcontinent, Oriental Region.

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Introduction

Bequaert (1925) described the genus *Parancistrocerus* as a subgenus of *Ancistrocerus* Wesmael based on the type species *Odynerus fulvipes* de Saussure, 1855 [= *O. "flavipes" Fabricius sensu de Saussure, 1852, non Vespa flavipes Fabricius, 1775*]. This genus is distributed in the Nearctic, Neotropical, Oriental and Palaearctic regions. Forty three species with 11 additional subspecies are reported from the Oriental region of which eight species with two additional subspecies are known from the Indian subcontinent. In this paper three new species, namely, *Parancistrocerus jaferpaloti* Girish Kumar and Carpenter sp. n., *P. loharbandensis* Girish Kumar and Carpenter sp. n. and *P. turensis* Girish Kumar and Carpenter sp. n. are described from India. The species *P. holzschuhi* Gusenleitner, 1987, is recorded here for the first time from India. The male of *P. vicinus* Giordani Soika, 1994, is described. *Parancistrocerus intermediatus* (Sonan, 1939), *P. nitobei* (Sonan, 1939), *P. kuraruensis* (Sonan, 1939) and *P. taikonus*

(Sonan, 1939) are new combinations. A key to species of the Indian subcontinent and an updated checklist of Oriental species are also provided here.

Materials and Methods

The specimens were studied and photographed using a Leica Stereo microscope with LAS software version 3.6.0. Type specimens and other specimens are properly preserved and added to the 'National Zoological Collections' of ZSIK.

Abbreviations used for the Museums: BMNH: British Museum (Natural History), London, England; MSNG: Museo Civico di Storia Naturale di Genova Giacomo Doria, Genova, Italy; MSNV: Museo di Storia Naturale di Venezia, Venice, Italy; OLM: Oberösterreichischen Landesmuseum, Linz, Austria; RMNH: Nationaal Natuurhistorisch Museum (formerly Rijksmuseum van Natuurlijke Historie), Leiden, Netherlands; ZMB: Museum für

Naturkunde, Berlin, Germany; ZSIK: Western Ghat Regional Centre, Zoological Survey of India, Kozhikode (= Calicut), India.

Abbreviations used for the terms: F = Flagellar segments; H = Head; M = Mesosoma; OOL = Ocellocular distance; POL = Post ocellar distance; S = Metasomal sterna; T = Metasomal terga.

Genus *Parancistrocerus* Bequaert

Parancistrocerus Bequaert, 1925: 64, subgenus of *Ancistrocerus* Wesmael. Type species: *Odynerus fulvipes* de Saussure, 1855 [= *O. "flavipes* Fabricius" *sensu* de Saussure, 1852, *non Vespa flavipes* Fabricius, 1775], by original designation.

Diagnosis: T2 smooth basally, forming acarinarium beneath apex of T1 that is often full of mites (often concealed, tergum should be bent backwards to expose acarinarium); anterior face of pronotum with two close set, deeply impressed fovea, which may be approximated; propodeum with submarginal carina produced into pointed lamella apically and valvula enlarged and free posteriorly from submarginal carina; metanotum without tubercles; forewing with second submarginal cell not petiolate; metasoma sessile.

Distribution: Nearctic, Neotropical, Oriental and Palaearctic regions.

Key to species and subspecies of *Parancistrocerus* Bequaert from the Indian subcontinent

(Modified from Giordani Soika, 1994)

1. T2 with apical margin prolonged in middle (see Fig. 1 of Giordani Soika, 1972: 102 and Fig. 41 of Giordani Soika, 1994: 163).....2
- T2 with apical margin normal, not prolonged in middle (Figs. 6, 12, 18, 27, 33 & 39).....6
2. Superior carina of the propodeum well developed and distinct, especially at the top, where they clearly separate the horizontal dorsal face of the propodeum from the posterior face.....*P. capocacciai* Giordani Soika
- Superior carina of propodeum not developed as above and irregular, no clear separation of dorsal and posterior surfaces

- of the propodeum.....3
3. Female unknown. Male: distance between clypeal teeth much shorter than basal width of clypeus, area between clypeal teeth more closely emarginate at apex; antennae with 11th article short, not longer than wide; apical antennal article very long, its apex reaches far beyond base of 11th article.....*P. irritatus* Giordani Soika
- Male: distance between clypeal teeth slightly less than basal width of clypeus, area between clypeal teeth broadly emarginate at apex; antennae with 11th article long, about 1.50x as long as wide; apical antennal article short, its apex reaches to or slightly beyond base of 11th article.....*P. incorruptus* Giordani Soika.....4
4. T1 mostly red-ferruginous.....5
- T1 not red-ferruginous.....ssp. *kalimpongensis* Giordani Soika
5. Propodeum mostly red-ferruginous; T2 without apical yellow band.....ssp. *incorruptus* Giordani Soika
- Propodeum black; T2 with apical yellow band.....ssp. *demens* Giordani Soika
6. T2 strongly reflexed at apex.....*P. assamensis* (Meade-Waldo)
- T2 not reflexed at apex.....7
7. S2 strongly and sharply lowered at base then widely and almost entirely depressed.....8
- S2 convex at base, very weakly depressed after.....9
8. Anterior face of T1 without median vertical carina on its upper half; clypeus of female more widely and deeply emarginate at apex.....*P. rhipheus* (Cameron)
- Anterior face of T1 with median vertical carina on its upper half (Fig. 11); clypeus of female more narrowly and less deeply emarginate at apex (Fig. 8).....*P. holzschuhi* Gusenleitner
9. Vertical anterior face of T1 about as long as, or even longer than dorsal horizontal face.....10
- Vertical anterior face of T1 distinctly shorter than dorsal horizontal face.....11
10. Width between apical teeth of clypeus equal to width between antennal sockets; upper carina of propodeum lamellate; punctures on T1 and T2 denser; markings

- on pronotum, mesopleuron, metanotum, T1, T2 and S2 ferruginous.....*P. feai*
Giordani Soika
- Width between apical teeth of clypeus less than width between antennal sockets (Fig. 29); upper carina of propodeum not lamellate (Fig. 32); punctures on T1 and T2 fine, superficial; markings on pronotum, mesopleuron, metanotum, T1, T2 and S2 yellow.....*P. turensis*
Girish Kumar & Carpenter sp. n.
 - 11. Dorsal face of propodeum absent mesally, not forming horizontal area behind midline of metanotum (Figs. 16 & 38).....12
 - Dorsal face of propodeum forming horizontal area behind midline of metanotum (Figs. 5 & 26).....13
 - 12. T2 with almost regular apical yellow band, about 2 irregular rows of punctures at median area of yellow band; punctures on T2 larger than that of alternative species; T1 with narrow apical yellow band, about 2-3 irregular rows of punctures at yellow band; clypeus of female black with broad yellow band at base and apex.....
.....*P. vicinus* **Giordani Soika**
 - T2 with wavy apical yellow band, about 4-5 irregular rows of punctures at median area of yellow band; punctures on T2 smaller than that of alternative species; T1 with broad apical yellow band, about 4-6 irregular rows of punctures at yellow band; clypeus of female yellow except a brownish black spot at middle.....
.....*P. jaferpaloti* **Girish Kumar & Carpenter sp. n.**
 - 13. Occipital carina complete (Fig. 4); interspaces between punctures on mesopleuron and posterior portion of mesoscutum not carinate; body punctures less strong than that of alternative species; in female, cephalic fovea with a single deep pit.....*P. androcles androcles*
(Meade-Waldo)
 - Occipital carina not complete, evanescent at vertex (Fig. 25); interspaces between punctures on mesopleuron and posterior portion of mesoscutum carinate; body punctures stronger than that of alternative species; in female, cephalic fovea with two closely set pits.....*P. loharbandensis*
Girish Kumar & Carpenter sp. n.

1. *Parancistrocerus androcles androcles*

(Meade-Waldo, 1910)

(Figs. 1-6)

Odynerus androcles Meade-Waldo, 1910: 103, female (in subgenus *Ancistrocerus*), "Shillong, Assam [= Shillong, Meghalaya]" (BMNH).

Ancistrocerus horni Sonan, 1938: 262, figs. 4-6, male, "Kandy, Ceylon" (ZMB); Giordani Soika, 1941: 236 (syn. of *A. androcles* (Meade-Waldo)).

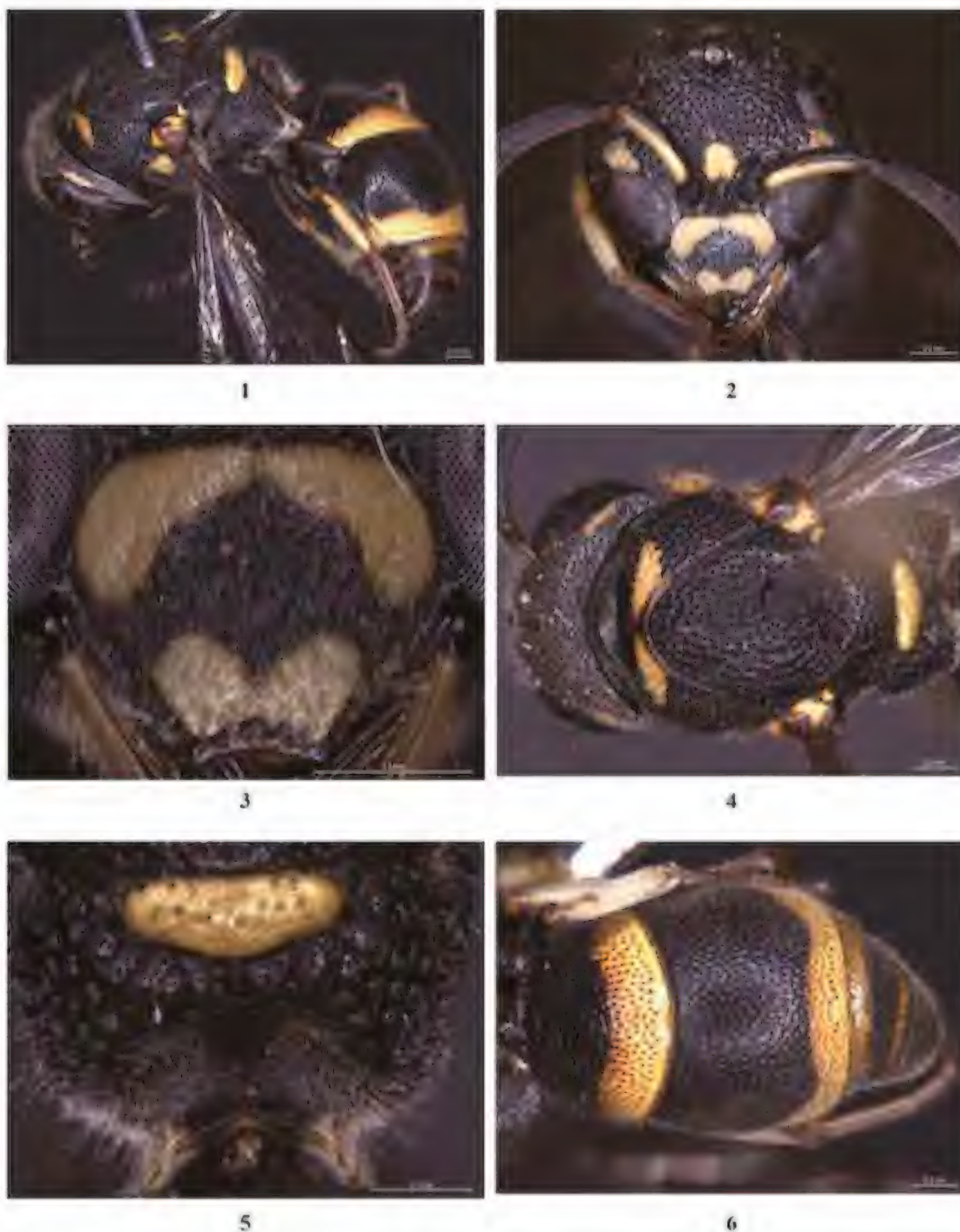
Ancistrocerus androcles; Giordani Soika, 1941: 236 (in subgenus *Ancistrocerus*; syn.: *Ancistrocerus horni* Sonan, 1938; Burma).

Parancistrocerus androcles androcles; Gusenleitner, 1988: 178 (Thailand); Giordani Soika, 1994: 159 (key), 195 (Sri Lanka; Burma; Vietnam; Malaya; Singapore; Sumatra; Java; Borneo; Sulawesi; Philippines); Gusenleitner, 2001: 659 (Thailand); Gusenleitner, 2006: 689 (India: Kerala).

Diagnosis: Female (Fig. 1): Occipital carina complete (Fig. 4); cephalic fovea a single deep pit; clypeus (Fig. 3) slightly wider than long, weakly convex, punctures superficial, with median area nearly flat, weakly emarginate apex and apical teeth short and triangular, distance between teeth 1/3 of maximum width of clypeus; dorsal face of propodeum (Fig. 5) forming horizontal area behind the midline of metanotum, with punctures large, shallow, flat bottomed, with interspaces carinate; posterior face of propodeum widely and regularly concave; vertical anterior face of T1 distinctly shorter than dorsal horizontal face; dorsal horizontal face of T1 about 1.5x as wide as its median length; T2 (Fig. 6) much wider than long, not reflexed at apex, with apical margin normal, not prolonged in middle; T1 and T2 with punctures much smaller than those of pronotum and mesoscutum, with interspaces on average equal to diameter of punctures; S2 convex at base, very weakly depressed after, with punctures larger and much more spaced.

Colour description: Body black with yellow and ferruginous markings. Yellow markings: spot at base of mandible; band at base and two specks (sometimes fused) apically on clypeus; lower side of scape; spot above space interantennal space; at ocular sinus; linear mark on tempora; band on pronotum; tegulae (except median ferruginous area); parategula;

Plate I



Figs. 1-6 *Parancistrocerus androcles androcles* (Meade-Waldo) female. 1, Body profile; 2, Head frontal view; 3, Clypeus; 4, Head & mesosoma dorsal view; 5, Metanotum & propodeum; 6, Metasoma dorsal view.

metanotum; at top of mesepisternum (sometimes absent); apex of fore and mid femora; outer face of all tibiae (sometimes reduced or absent); apical bands on T1, T2 and S2 (sometimes narrow bands on T3 & S3, rarely on S4 also). Ferruginous markings: lower side of antennal funicles; tarsi of all legs; tegulae (except yellow markings). Wings

almost hyaline, fore wing with subapical fuscous cloud. Head and mesosoma with short tawny pubescence and erect whitish hairs of varying length with fine golden pubescence and sparse white hairs inclined.

Length (H+M+T1+T2): 6-7 mm.

Male: Clypeus wider than long, almost

regularly convex, with sparse minute punctures, apex slightly emarginate, distance between teeth 1/3 of maximum width of clypeus; apical antennal article finger-shaped, gradually narrowed to apex that reaches base of 11th article; pilosity more abundant than that of female; clypeus with long, thick hairs. Colour similar to that of female except mandible and clypeus entirely yellow. Other characters almost as those of female.

Material examined: INDIA: Kerala, Kozhikode Dist., Muthappanpuzha, 1♀, 27.ix.2012, Coll. K.P. Mohammed Shareef, ZSIK Regd. No. ZSI/WGRS/I.R-INV.6948; Kozhikode Dist., Malabar Wildlife Sanctuary, Kakkayam, 1♀, 8.xii.2015, Coll. P. Girish Kumar, ZSIK Regd. No. ZSI/WGRS/I.R-INV.6949; Ernakulam Dist., Thattekkad Bird Sanctuary, Koottaampara, 1♀, 19.vi.2016, Coll. P. Girish Kumar, ZSIK Regd. No. ZSI/WGRS/I.R-INV.6950. Tripura, Unakoti Dist., Kailashahar, 1♀, 30.v.1978, Coll. A. Issar, ZSIK Regd. No. ZSI/WGRS/I.R-INV.6951.

Distribution: India: Kerala, Meghalaya, Tripura (new record); Sri Lanka; Myanmar; Thailand; Vietnam; Malaysia (including Sabah); Singapore; Indonesia: Sumatra, Java, Sulawesi; Philippines.

Remarks: A male specimen of this species was not available for our studies, hence the description was taken from Giordani Soika (1994).

2. *Parancistrocerus assamensis* (Meade-Waldo, 1910)

Odynerus assamensis Meade-Waldo, 1910: 103, male, female (in subgenus *Ancistrocerus*), "Shillong, Assam [= Shillong, Meghalaya]" (BMNH).

Ancistrocerus assamensis; Giordani Soika, 1941: 235 (in subgenus *Ancistrocerus*; Burma, Carin Cheba).

Parancistrocerus assamensis; Giordani Soika, 1994: 155 (key), 171 (Nepal; Vietnam); Gusenleitner, 2000: 940, fig. 1 (Laos); Gusenleitner, 2007: 99 (compared to *P. acclivus* Gusenleitner); Gusenleitner, 2011: 1358, fig. 7 (Laos); Gusenleitner, 2012: 1045 (compared to *P. insolitus* Gusenleitner).

Diagnosis: Female: T2 reflexed at apex, which is preceded by narrow preapical groove; S2 strongly and sharply lowered at base, then nearly flat or even slightly depressed; clypeus about as long as wide, emarginate at apex, with apical teeth shortly carinate.

Colour description: Body black with yellow and red markings. Yellow markings: spot at base and two small spots at apex of clypeus; small spot on lower frons above interantennal space. Red markings: ventral side of scape; anterior margin of pronotum; tegulae; large ovate spot on mesopleuron; metanotum; apical band on T1, T2 and S2; fore and mid tibiae. Wings clear hyaline, fuscous along costa.

Male: Clypeus about as long as wide, more closely emarginate at apex than in female, almost regularly convex; apical antennal article of male weakly arched, gradually narrowed from base to apex, and reaches to base of 11th article.

Length (H+M+T1+T2): Female & Male, 6-6.5 mm.

Distribution: India: Meghalaya; Nepal; Myanmar; Laos; Vietnam.

Remarks: No specimens were available for our studies, hence the description was taken from Meade-Waldo (1910) and Giordani Soika (1941, 1994).

3. *Parancistrocerus capocacciai* Giordani Soika, 1994

Parancistrocerus capocacciai Giordani Soika, 1994: 154 (key), 164, fig. 41, female, "Burma: Carin Cheba, 900-1100 m" (MSNG); Gusenleitner, 2011: 1358 (Laos).

Diagnosis: Female: T2 with apical margin prolonged in middle; superior carina of propodeum well developed and very clear, especially dorsally, where it clearly separates horizontal dorsal face of propodeum from posterior face; much bigger punctures on T2 preapically.

Colour description: Body black with brown ferruginous, red ferruginous and yellow markings. Brown ferruginous markings: antennae and legs. Red ferruginous markings: spot above interantennal space; ocular sinus; line on tempora; spot on upper mesepisternum; wide band on dorsal surface of pronotum, and

very narrow line on posterior margin of pronotum; tegulae; parategulae; metanotum almost entirely; narrow and regular apical band on T1; wider and equally regular apical band, on T2; narrow apical band on S2. Yellow markings: clypeus except large central brown mark; ventral side of scape; line on outer surface of fore tibia. Wing infumate, with large brown stain on marginal cell.

Male: Unknown.

Length (H+M+T1+T2): 9 mm.

Distribution: Myanmar; Laos.

Remarks: No specimens were available for our studies; hence the description was taken from Giordani Soika (1994).

4. *Parancistrocerus feai* Giordani Soika, 1994

Parancistrocerus feai Giordani Soika, 1994: 157 (key), 190, female, “Burma: Carin Chebà, 900-1100 m” (MSNG); also from Malaysia; India.

Diagnosis: Female: Base of S2 without longitudinal groove; vertical anterior face of T1 about as long as dorsal horizontal face; S2 convex at base, very weakly depressed after; T2 not reflexed at apex; T2 with apical margin normal, not prolonged at posterior margin medially; clypeus widely emarginate at apex, with width between apical teeth as long as width between antennal sockets; superior carina of propodeum much less developed, sides heavily depressed near propodeal valvula.

Colour description: Body black with yellow and ferruginous markings. Yellow markings: spot at base of mandibles; clypeus except large black cross band; ventral side of scape; apical spot on femur and line on outer face of fore tibia. Ferruginous markings: wide band along dorsal surface of pronotum anteriorly; spot, sometimes absent, on top of mesepisternum; metanotum; propodeal valvula; tegulae; parategulae; wide and regular apical bands on T1 and T2; narrow band on S2. Wings moderately infumate.

Length (H+M+T1+T2): 7-8 mm.

Male: Unknown.

Distribution: India: Sikkim; Myanmar; Malaysia.

Remarks: No specimens were available for our studies; hence the description was taken from Giordani Soika (1994).

5. *Parancistrocerus holzschuhi* Gusenleitner, 1987

(Figs. 7-12)

Parancistrocerus holzschuhi Gusenleitner, 1987: 258, figs. 3-5, male, female, “Nepal: Fußweg: Hedangna - Lamobagar, 1100-1200 m” (holotype male OLM); Giordani Soika, 1994: 156 (key), 171, fig. 45; Gusenleitner, 2013: 121 (compared to *P. simoni* n. sp.).

Diagnosis: Female (Fig. 7): Clypeus weakly emarginate at apex (Fig. 8); anterior face of T1 (Fig. 11) with well-developed vertical carina in upper half; horizontal carina of T1 distinct, and deformed by large punctures of dorsal face of T1, punctation of dorsal face abruptly stops at meeting with front face; front face of T1 without punctures; S2 strongly and sharply lowered at base after it wide and almost entirely depressed; T2 not reflexed at apex (Fig. 12); punctures on frons and vertex very coarse and dense, interspaces smaller than diameter of punctures; clypeus 1.2x broader than long.

Colour description: Body black with orange-yellow and red markings. Orange-yellow markings: two small spots at clypeus subapically (absent in Cherrapunji specimen); ventral side of antennal scape; small round spot on lower frons; outer side of fore tibiae. Red markings: small spots on tempora (very faint in Dirang specimen); wide uninterrupted band on pronotum; tegulae and parategulae; stain on upper portion of mesopleuron; transverse band on metanotum; apical band on T1 which narrows on both sides; uniform band on T2 and very narrow band on S2 which slightly enlarged at sides.

Length (H+M+T1+T2): 7-7.5 mm.

Variation: Colour pattern slightly varying as follows: In Gusenleitner’s description (1987: 261) of the Nepal paratype specimen, there is an orange-yellow short transverse spot at base of mandibles (but in our specimens from India, it is absent); orange-yellow mark present at outer side of fore and mid tibiae in Nepal specimen (no orange-yellow mark present at

Plate II



Figs. 7-12 *Parancistrocerus holzschuhi* Gusenleitner female. 7, Body profile; 8, Head frontal view; 9, Head & mesosoma frontal view; 10, Propodeum; 11, Anterior face of T1; 12, Metasoma dorsal view.

outer side of mid tibiae in Indian specimens).

Material examined: INDIA: Arunachal Pradesh, West Kameng Dist., Dirang, Alt. 1400 m, 1♀, 13.x.2001, Coll. B. Mitra & Party, ZSIK Regd. No. ZSI/WGRS/I.R-INV.6952. Meghalaya, East Khasi Hills Dist.,

Cherrapunji, Alt. 4400 ft., 1♀, 2-8.x.1914, Coll. S.W. Kemp, ZSIK Regd. No. ZSI/WGRS/I.R-INV.6953.

Distribution: India (new record): Arunachal Pradesh, Meghalaya; Nepal.

6. *Parancistrocerus incorruptus* Giordani Soika, 1972

Diagnosis: Female: Superior carina of propodeum little developed and irregular, hence no true dorsal surface of propodeum clearly separated from posterior; T2 swollen on sides, about as wide as long, having strong preapical groove, strongly punctured, followed by long translucent area, strongly reflexed and prolonged in middle; head, in frontal view, subcircular, about as wide as high; clypeus about as wide as long, weakly emarginate at apex, apical teeth short but sharp; eyes much closer to each other at clypeus than that on vertex; posterior ocelli closer to each other than to eyes; metanotum with very short horizontal dorsal face and much longer posterior face; tegulae wide, slightly longer than wide, with short, pointed posterior lobe; dorsal face of T1 about as long as wide at base; clypeus shiny, with more or less superficial punctures, of different thickness and average density, interspaces on average much more than diameter of punctures; T1 and T2 with punctures deep, round and little oblique, larger and more spaced than in mesoscutum; S2 with punctures even bigger, but much thinner than corresponding tergite.

There are three subspecies, namely, *P. incorruptus demens* Giordani Soika, *P. incorruptus incorruptus* Giordani Soika and *P. incorruptus kalimpongensis* Giordani Soika, all present in the Indian subcontinent.

6a. *Parancistrocerus incorruptus demens* Giordani Soika, 1972

Parancistrocerus incorruptus demens Giordani Soika, 1972: 102, fig. 2, male, “Sikkim” (ZMB); Giordani Soika, 1994: 155 (key), 165.

Diagnosis: Male: Clypeus slightly wider than long, its apex slightly emarginate, width of clypeal apex equal to about 1/3 of maximum width of clypeus; antennae (see Fig. 2 of Giordani Soika, 1972: 102) elongate, article III-X longer than wide, article XI 1.5x as long as wide; apical article very long and slender, about 5x as long as wide at base, slightly arched and very little narrower towards apex, which reaches base of 11th article; first tarsal segment of mid leg normal, cylindrical with uniform thickness.

Colour description: Body black with yellow markings. Yellow markings: mandible;

clypeus; most part of scape; spot on interantennal space; ocular sinus; band on metanotum; front face of fore and mid coxa; apex of femurs and outer face of fore and mid tibiae; narrow and regular apical band on T1; narrow and wider apical band on T2. Wings very darkened, especially along costa and at apex.

Length (H+M+T1+T2): 8.5-9 mm.

Distribution: India: Sikkim.

Remarks: No specimens were available for our studies, hence the description was taken from Giordani Soika (1972).

6b. *Parancistrocerus incorruptus incorruptus* Giordani Soika, 1972

Parancistrocerus incorruptus Giordani Soika, 1972: 101, fig. 1, female, “Assam” (MSNV).

Parancistrocerus incorruptus incorruptus Giordani Soika, 1994: 155 (key).

Colour description: Female: Body black with yellow and ferruginous markings. Yellow markings: base of mandible; apex and sides of clypeus; spot above inter antennal space; ocular sinus; ventral side of scape; linear mark on tempora; parategula; most of metanotum; stain on propodeal valvula, which extends little on sides of posterior face of propodeum; a line along outer face of fore and mid tibiae; narrow and regular apical band on T1, which extends alongside margins. Ferruginous: ventral side of antennal funicles; wide band on dorsal surface of pronotum; posterior face of propodeum, extends to dorsal and lateral sides; T1, except large triangular black spot preapical and apical transverse yellow band; S1. Fore wing infumate at apex and along costa, with stigma yellow-ferruginous.

Length (H+M+T1+T2): 9.5 mm.

Distribution: India: Assam.

Remarks: No specimens were available for our studies, hence the description was taken from Giordani Soika (1972).

6c. *Parancistrocerus incorruptus kalimpongensis* Giordani Soika, 1994

Parancistrocerus incorruptus kalimpongensis Giordani Soika, 1994: 154 (key), 165, male, “India: Dajeeling, Kalimpong”

[recte: Darjeeling] (RMNH).

Male: This subspecies differs from other two subspecies by the absence of red spots on propodeum and on T1 and for the presence of a yellow apical band on T1.

Distribution: India: West Bengal.

Female: Unknown.

7. *Parancistrocerus irritatus* Giordani

Soika, 1972

Parancistrocerus irritatus Giordani Soika, 1972: 103, fig. 3, male, “Sikkim” (ZMB); Giordani Soika, 1994: 154 (key), 164.

Diagnosis: Male: Distance between clypeal teeth much shorter than basal width of clypeus, area between clypeal teeth more closely emarginate at apex; antennae with 11th article short, not longer than wide; apical antennal article very long, and its apex reaches far beyond base of 11th article (see Fig. 3 of Giordani Soika, 1972: 102); superior carina of propodeum little developed and irregular, hence no true dorsal surface of propodeum clearly separated from posterior; T2 with apical margin prolonged in middle; mesosoma 1.5x longer than wide; T2 about 1.25x longer than wide, slightly round at sides.

Colour description: Body black with yellow and ferruginous to yellow-ferruginous markings. Yellow portions: mandible; clypeus; inter antennal space; ocular sinus; ventral side of scape; linear mark on tempora; wide band along anterior margin of pronotum; front and rear ends of tegulae; parategulae; metanotum; large mark on mid and hind coxae; apex of femur and outer face of fore and mid tibiae; regular band at apex of T1, extended to side margins; wide band at apex of T2 and narrow band at apex of S2; apical margins of S3 and S4. Ferruginous to yellow-ferruginous: antennae; posterior margin of pronotum; tegulae except yellow markings; legs except yellow markings. Fore wing infumate along costa, with large dark spot at apex.

Length (H+M+T1+T2): 9-9.5 mm.

Distribution: India: Sikkim.

Remarks: No specimens were available for our studies, hence the description was taken from Giordani Soika (1972).

8. *Parancistrocerus jaferpaloti* Girish

Kumar & Carpenter sp. n.

(Figs. 13-21)

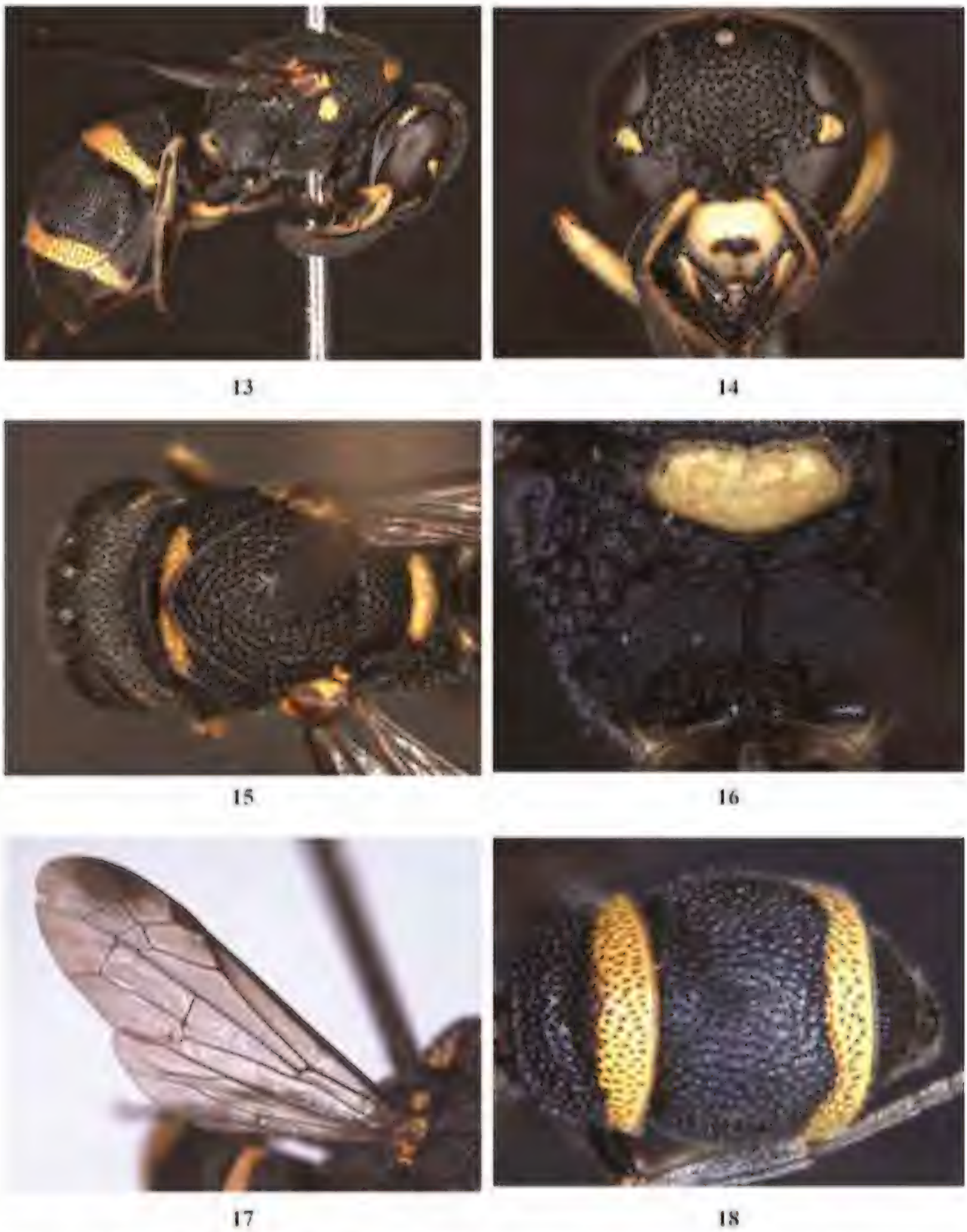
[urn:lsid:zoobank.org:act:CBFA052E-99A6-43E5-88B7-C6370952FAFE](https://zoobank.org/act:CBFA052E-99A6-43E5-88B7-C6370952FAFE)

Description: Holotype female (Fig. 13):

Head: 0.91x as wide as long in frontal view (Fig. 14); clypeus strongly convex, apex with two teeth, not sharp, area in between them moderately incised, distance between teeth 1.22x distance between antennal toruli, maximum width of clypeus 1.19x its length medially, with small punctures; both mandibles with 5 teeth; frons, vertex and tempora with punctures small, deep and almost uniformly arranged; POL 0.93x OOL; distance between anterior ocellus and posterior ocelli 1.15x as long as diameter of anterior ocellus; distance between two posterior ocelli 1.91x as long as diameter of posterior ocellus; ocellar triangle not protruding; cephalic foveae present as two closely arranged pits, diameter of each pit slightly larger than that of surrounding punctures; tempora 0.57x as wide as eye in profile (measured through ocular sinus); interocular distance 1.65x greater on vertex than at clypeus; occipital carina not complete, evanescent at vertex. Antennal sockets 3.50x farther from each other than from eyes; scape 4.11x as long as F1; F1 1.06x as long as F2, 1.13x as long as wide; flagellomeres widening towards apex; clava 1.09x as long as wide.

Mesosoma: Median area of anterior face of pronotum with two deeply impressed, well separated foveae mesally; lateral sides of anterior face of pronotum with few scattered punctures; pronotal carina absent dorsally, present laterally; posterior face and lateral sides of pronotum, mesoscutum and scutellum strongly and closely punctate, diameter of punctures, on average, as large as or greater than distance between punctures (Fig. 15); scutellum with deep transverse groove at anterior margin; median length of mesoscutum

Plate III



Figs. 13-18 *Parancistrocerus jaferpaloti* Girish Kumar & Carpenter sp. n. Holotype female. 13, Body profile; 14, Head frontal view; 15, Head & mesosoma dorsal view; 16, Metanotum & propodeum; 17, Wings; 18, Metasoma dorsal view.

as long as its maximum width; metanotum with strong punctures, interspaces carinate; mesopleuron closely punctured except large area of epicnemium and posterior margin smooth; epicnemial carina present; upper metapleuron with few strong transverse striations and large, deep pits; lower

metapleuron with a vertical row of deep pits, interspaces carinate. Dorsal face of propodeum not forming horizontal area behind midline of metanotum (Fig. 16); posterior face of propodeum concave, with strong median carina; area separating dorso-lateral face of propodeum from posterior face carinate and

becoming lamellate on either side behind metanotum; posterior face of propodeum finely striate; dorso-lateral sides of propodeum with large punctures, interspaces strongly carinate; lateral sides of propodeum smooth except upper portion with moderately strong punctures, interspaces mostly carinate; submarginal carina strongly projecting as lobe above propodeal valvula. Tegula smooth with minute punctures, not evenly rounded posteriorly, emarginate adjoining parategula and shorter than apex of latter posteriorly; forewing (Fig. 17) with pterostigma 3.6x length of prestigma, first and second recurrent veins received in second submarginal cell.

Metasoma (Fig. 18): T1 with regular, strong transverse carina separating vertical face from dorsal face; vertical anterior face of T1 distinctly shorter than dorsal horizontal face; vertical face of T1 almost smooth with few weak scattered punctures; dorsal face of T1 with broad apical yellow band, narrowed at sides, about 4-6 irregular rows of punctures at median area of yellow band; dorsal face of T1 1.66x as wide as its median length; T2 with wavy apical yellow band, about 4-5 irregular rows of punctures at median area of yellow band; T2 1.26x as wide as its median length; maximum width of T2 1.10x than that of T1; T2 not reflexed at apex, with apical margin normal, not prolonged in middle; S2 convex at base, very weakly depressed after.

Colour description: Body black with yellow and brown ferruginous markings. Yellow markings: spot at base of mandibles; clypeus except a brownish black spot at middle and brownish black outer border; ocular sinus; small mark on tempora; lower side of scape; wide band on dorsal surface of pronotum; speck on top of mesepisternum; tegula (except median brown area); parategula; metanotum; apical mark on fore and mid femora; mark on all tibiae; basitarsal segment of fore leg; wide apical band on T1, narrowed at sides; wavy apical bands on T2 & S2. Brown ferruginous markings: lower face of basal funicles; tegulae (excluding yellow portions); all tarsi except basitarsal segment of fore leg. Wings almost hyaline, fore wing with subapical fuscous cloud. Body with small silvery white pubescence.

Length (H+M+T1+T2): 6.5 mm.

Male (Fig. 19): Clypeus more emarginate at apex than that of female (Fig. 20); apical antennal article pointed at apex and not reaching to base of 11th article in curved position (Fig. 21). Colour similar to that of female except clypeus entirely yellow; yellow stain present on front, above interantennal space, extended to base of clypeus; yellow spot present on mid and hind coxa.

Length (H+M+T1+T2): 6 mm.

Material examined: Holotype female, INDIA: Kerala, Kozhikode Dist., Malabar Wildlife Sanctuary, Kakkayam, 8.xii.2015, Coll. Md. Jafer Palot, ZSIK Regd. No. ZSI/WGRS/I.R-INV.6954. Paratypes: INDIA: Kerala, Kannur Dist., Aralam Wildlife Sanctuary, 1♀, 10.v.2009, Coll. K. Rajmohana & Party, ZSIK Regd. No. ZSI/WGRS/I.R-INV.6955; Kozhikode Dist., Muthappanpuzha, 1♂, 27.ix.2012, Coll. K.P. Mohammed Shareef, ZSIK Regd. No. ZSI/WGRS/I.R-INV.6956; Malappuram Dist., Nilambur, 1♂, 1.vi.2012, Coll. K.P. Mohammed Shareef, ZSIK Regd. No. ZSI/WGRS/I.R-INV.6957.

Distribution: India: Kerala.

Etymology: The species is named after Dr. Md. Jafer Palot, Assistant Zoologist, Western Ghat Regional Centre, Zoological Survey of India, Kozhikode, who collected the holotype.

Discussion: This new species comes close to *P. vicinus* Giordani Soika, 1994, in having: dorsal face of propodeum absent at midline, not forming horizontal area behind midline of metanotum; vertical anterior face of T1 distinctly shorter than dorsal horizontal face; S2 convex at base, very weakly depressed after; T2 not reflexed at apex, with apical margin normal, not prolonged in middle. However, this new species differs from *P. vicinus* in having: (1) T2 with wavy apical yellow band, about 4-5 irregular rows of punctures at median area of yellow band (in *P. vicinus*, T2 with almost regular apical yellow band, about 2 irregular rows of punctures at median area of yellow band); (2) Punctures on T2 smaller than that of *P. vicinus*; (3) T1 with broad apical yellow band, about 4-6 irregular rows of punctures at yellow band (in *P. vicinus*, T1 with narrow apical yellow band,

Plate IV



Figs. 19-21 *Parancistrocerus jaferpuloti* Girish Kumar & Carpenter sp. n. Paratype male. 19, Body profile; 20, Head frontal view; 21, Apical antennal articles. Figs. 22-24 *P. loharbandensis* Girish Kumar & Carpenter sp. n. Holotype female. 22, Body profile; 23, Head frontal view; 24, Clypeus.

about 2-3 irregular rows of punctures at yellow band); (4) Clypeus of female yellow except brownish black spot at middle (in *P. vicinus*, clypeus of female black with broad yellow band at base and apex).

9. *Parancistrocerus loharbandensis* Girish Kumar & Carpenter sp. n.
(Figs. 22-27)

[urn:lsid:zoobank.org:act:332BA746-D058-487D-A570-24FBA3F09127](https://zoobank.org/urn:lsid:zoobank.org:act:332BA746-D058-487D-A570-24FBA3F09127)

Description: Holotype female (Fig. 22):

Head: 1.04x as wide as long in frontal view (Fig. 23); clypeus (Fig. 24) strongly convex, apex with two teeth, not sharp, area in between them moderately incised, distance between teeth more than (1.17x) distance between antennal toruli, maximum width of clypeus 1.06x its length medially, with small punctures; frons, vertex and tempora with punctures small, deep and almost uniformly arranged; POL 1.15x OOL; distance between anterior ocellus and posterior ocelli 1.14x as long as diameter of anterior ocellus; distance between two posterior ocelli 2.37x as long as diameter of posterior ocellus; ocellar triangle not strongly protruded; cephalic foveae present as two closely arranged pits, diameter of each pit slightly larger than that of surrounding punctures; tempora 0.63x as wide as eye in profile (measured through ocular sinus); interocular distance 1.71x greater on vertex than at clypeus; occipital carina not complete, evanescent at vertex (Fig. 25). Antennal sockets 3.75x farther from each other than from eyes; scape 4.67x as long as F1; F1 1.04x as long as F2, 1.17x as long as wide; flagellomeres widening towards apex except clava.

Mesosoma: Median area of anterior face of pronotum with two deeply impressed foveae mesally; lateral sides of anterior face of pronotum with few scattered punctures; pronotal carina absent dorsally, present laterally; posterior face and lateral sides of pronotum, mesoscutum and scutellum strongly and closely punctate, diameter of punctures, on average, larger than distance between punctures; scutellum with deep transverse groove at anterior margin; median length of mesoscutum 1.05x as long as its maximum width; metanotum with strong, large punctures, interspaces carinate; mesopleuron closely punctured except large area of epicnemium and posterior margin smooth; epicnemial carina present; upper metapleuron with few strong transverse striations and large, deep pits; lower metapleuron with single vertical row of deep pits, interspaces carinate. Dorsal face of propodeum forming horizontal area behind midline of metanotum (Fig. 26); posterior face of propodeum weakly concave, with strong median carina; area separating dorso-lateral face of propodeum from posterior

face carinate and becoming lamellate on either side behind metanotum; posterior face of propodeum finely striate; dorso-lateral sides of propodeum with large punctures, interspaces strongly carinate; lateral sides of propodeum smooth except upper portion with moderately strong punctures, interspaces mostly carinate; submarginal carina strongly projecting as a lobe above propodeal valvula. Tegula smooth with minute punctures, not evenly rounded posteriorly, emarginate adjoining parategula and shorter than apex of latter posteriorly; forewing with pterostigma 4.14x length of prestigma, first and second recurrent veins received in second submarginal cell.

Metasoma (Fig. 27): T1 with regular, strong transverse carina separating vertical face from dorsal face; vertical anterior face of T1 distinctly shorter than dorsal horizontal face; vertical face of T1 almost smooth with few weak scattered punctures; dorsal face of T1 with almost regular apical yellow band, about 3 irregular rows of punctures at yellow band; dorsal face of T1 1.57x as wide as its median length; T2 with weak wavy apical yellow band, about 3-4 irregular rows of punctures at median area of yellow band; T2 1.23x as wide as its median length; maximum width of T2 slightly larger (1.11x) than that of T1; T2 not reflexed at apex, with apical margin normal, not prolonged in middle; S2 convex at base, very weakly depressed after.

Colour description: Body black with yellow and brown ferruginous markings. Yellow markings: spot at base of mandibles; clypeus except a black spot at middle and brown outer border; ocular sinus; small mark on tempora; lower side of scape; wide band on dorsal surface of pronotum; speck on top of mesepisternum; tegula (except median brown area); parategula; metanotum; apical mark on fore and mid femora; mark on all tibiae; almost regular apical band on T1, T2 & S2; band on S2 narrower than T2. Brown ferruginous markings: lower face of basal funicles; tegulae (excluding yellow portions); all tarsi. Wings almost hyaline, fore wing with subapical fuscous cloud. Body with short silvery white pubescence.

Length (H+M+T1+T2): 6.5 mm.

Male: Unknown.

Plate V



Figs. 25-27 *Parancistrocerus loharbandensis* Girish Kumar & Carpenter sp. n. Holotype female. 25, Head & mesosoma dorsal view; 26, Metanotum & propodeum; 27, Metasoma dorsal view. Figs. 28-30 *P. turensis* Girish Kumar & Carpenter sp. n. Holotype female. 28, Body profile; 29, Head frontal view; 30, Clypeus

Material examined: Holotype female, INDIA: Assam, Cachar Dist., Loharband, 3.x.1975, Coll. N. Muraleedharan & Party, ZSIK Regd. No. ZSI/WGRS/I.R-INV.6958.

Distribution: India: Assam.

Etymology: The species name is after its collection locality.

Discussion: This new species comes close to *P. androcles androcles* (Meade Waldo, 1910) in having: dorsal face of propodeum forming a horizontal area behind midline of metanotum; vertical anterior face of T1 distinctly shorter than dorsal horizontal face; S2 convex at base, very weakly depressed after; T2 not reflexed at apex, with apical margin normal, not prolonged in middle. However, this new species differs from *P. androcles androcles* in

having: (1) Occipital carina not complete, evanescent at vertex (in *P. androcles androcles*, occipital carina complete); (2) Interspaces between punctures on mesopleuron and posterior portion of mesoscutum carinate (in *P. androcles androcles*, interspaces between punctures on mesopleuron and posterior portion of mesoscutum not carinate); (3) Body punctures stronger than that of alternative species; (4) In female, cephalic foveae as two close set pits (in *P. androcles androcles* females, cephalic foveae as single large deep pit).

10. *Parancistrocerus rhipheus* (Cameron, 1904)

Odynerus rhipheus Cameron, 1904: 308, female, "Darjeeling" (BMNH); Meade-Waldo, 1910: 103 (in subgenus *Ancistrocerus*; notes on type; related to *A. assamensis*).

Ancistrocerus rhipheus; Giordani Soika, 1941: 235.

Parancistrocerus rhipheus; Giordani Soika, 1994: 136 (key), 156 (key), 172; Gusenleitner, 2011: 1359 (Laos).

Diagnosis: Female: T1 slightly wider than long, subquadrate and strongly carinate at base; front face of T1 without median vertical carina on its upper half; S2 strongly and sharply lowered at base, then wide and almost entirely depressed; T2 approximately as wide as long, slightly wider at base than at apex, apical margin very slightly reflexed; clypeus as wide as long; tempora well developed, in dorsal view appearing about as long as upper lobes of eyes; pronotal carina present only laterally up to humeri; mesepisternum with epicnemial carina well developed; posterior face of propodeum oblique, entirely concave; clypeus with dense punctures, medium thickness, interspaces on average less than diameter of punctures; punctures on frons and vertex slightly smaller, bigger and thicker; punctures of dorsal face of propodeum big, irregular, shallow and flat bottomed, interspaces slightly carinate; posterior face of propodeum smooth, finely wrinkled; T1 thickly punctured, with punctures much bigger than those of mesosoma, interspaces mostly carinate; punctures of T2 equally large, but much more widely spaced, only at apex with slightly thicker punctures; punctures of S2 similar to those of T2, but considerably more

spaced.

Colour description: Body black with red markings. Red portions: spot on frons above interantennal space; mark on tempora; band on pronotum; small spot on mesepisternum; parategulae; apical band on T1 which narrowed at sides; relatively wide regular bands on T2 and S2. Legs and tegulae completely black. Wings infumate, especially along coast.

Distribution: India: West Bengal; Laos.

Remarks: No specimens were available for our studies, hence the description was taken from Giordani Soika (1994).

11. *Parancistrocerus turensis* Girish Kumar & Carpenter sp. n.
(Figs. 28-33)

[urn:lsid:zoobank.org:act:5A4656BE-F228-4342-B818-8ED615B5DA8E](https://zoobank.org/act:5A4656BE-F228-4342-B818-8ED615B5DA8E)

Description: Holotype female (Fig. 28):

Head: 0.96x as wide as long in frontal view (Fig. 29); clypeus (Fig. 30) slightly convex, median area almost flat, extreme apex with two teeth, not sharp, area in between them moderately incised, distance between teeth 0.82x distance between antennal toruli, maximum width of clypeus 1.14x its length medially, with small punctures; frons, vertex and tempora with punctures small and uniformly arranged, diameter of punctures in average less than distance between punctures; POL 1.20x OOL; distance between anterior ocellus and posterior ocelli 1.37x as long as diameter of anterior ocellus; distance between two posterior ocelli 2.38x as long as diameter of posterior ocellus; ocellar triangle protruding; cephalic foveae absent; tempora 0.49x as wide as eye in profile (measured through ocular sinus); interocular distance 1.54x greater on vertex than at clypeus; occipital carina complete and narrowed ventrally; distinct groove present along vertex near occipital carina. Antennal sockets 4.67x farther from each other than from eyes, with granulate punctures; scape 3.29x as long as F1; F1 1.30x as long as F2, as long as wide; flagellomeres widening towards apex.

Mesosoma (Figs. 31 & 32): Anterior face of pronotum uniformly sculptured in front and distinctly slanting, median area with a deeply

impressed fovea; pronotal carina absent dorsally, present laterally; posterior face and lateral sides of pronotum, mesoscutum and scutellum strongly and closely punctate, diameter of punctures, on average, as large as or greater than distance between punctures; scutellum with a row of rugose punctures at anterior margin, interspaces carinate; median length of mesoscutum 1.02x its maximum width; metanotum with few scattered punctures; mesopleuron closely punctured except large area of epicnemium and posterior margin smooth; epicnemial carina present; upper metapleuron with few strong transverse striations, lower metapleuron with a vertical row of transverse striations and punctures. Dorsal face of propodeum forming a horizontal area behind midline of metanotum, this horizontal area strongly depressed medially (Fig. 32); posterior face of propodeum almost rounded, concave; area separating dorsal face of propodeum from posterior face not lamellate; median concave area of posterior face of propodeum almost smooth; submarginal carina strongly projecting as lobe above propodeal valvula. Tegula smooth with minute punctures, not evenly rounded posteriorly, emarginate adjoining parategula and shorter than apex of latter posteriorly; forewing with pterostigma 4.4x prestigma, first recurrent vein received in second submarginal cell and second recurrent vein completely interstitial to submarginal cell II and III.

Metasoma (Fig. 33): T1 with irregular transverse carina separating vertical face from dorsal face; vertical anterior face of T1 about as long as dorsal horizontal face; vertical face of T1 almost smooth with few strong scattered punctures; dorsal face of T1 with few large irregular pits just after transverse carina, then small scattered punctures except at apical area smooth; dorsal face of T1 1.93x as wide as its median length; punctures on T2 fine and superficial except at apex and sides more stronger, which distinctly less deeper and superficial than that of mesoscutum; T2 1.06x as wide as its median length; T1 and T2 with narrow apical lamella present, not prolonged in middle; maximum width of T2 1.26x than that of T1; T2 not reflexed at apex; S2 convex at base, very weakly depressed after.

Colour description: Body black with yellow and brown markings. Yellow markings: basal half of mandible; two markings on either side

of clypeus, which invaginated at inner sides; ventral side of scape; spot on inter antennal space; ocular sinus; linear mark on tempora towards vertex; broad band on dorsal face of pronotum anteriorly; small spot on mesopleuron; tegula except brown rounded spot medially; parategula; a band on metanotum; propodeal valvula; apical bands on T1, T2 & S2, of which band on T2 & S2 more broader; very narrow band on T3 & T4, which disappears laterally; outer apex of fore and mid femur; tibia and tarsi of all legs. Brown markings: apical half of mandibles; ventral sides of flagellar segments. Wings almost hyaline, fore wing with subapical fuscous cloud. Body with silvery white hairs.

Length (H+M+T1+T2): 6.5 mm.

Male: Unknown.

Material examined: Holotype female, INDIA: Meghalaya, West Garo Hills Dist., Tura, 3.v.1979, Coll. J.K. Jonathan & Party, ZSIK Regd. No. ZSI/WGRS/I.R-INV.6959.

Distribution: India: Meghalaya: Tura.

Etymology: The species name is after its collection locality.

Discussion: As per the key of Giordani Soika (1994: 153) this new species comes close to *P. feai* Giordani Soika, 1994, in having: base of S2 without longitudinal groove; vertical anterior face of T1 about as long as dorsal horizontal face; S2 convex at base, very weakly depressed after; T2 not reflexed at apex; T2 with apical margin normal, not prolonged at posterior margin medially. However, this new species differs from *P. feai* in having: (1) Width between apical teeth of clypeus less than width between antennal sockets (8: 10) (in *P. feai*, width between apical teeth of clypeus equal to the width between antennal sockets); (2) Upper carina of propodeum not lamellate (in *P. feai*, upper carina of propodeum lamellate); (3) Punctures on T1 and T2 fine and superficial (in *P. feai*, punctures on T1 and T2 denser); (4) Markings on pronotum, mesopleuron, parategula, metanotum, propodeal valvula, T1, T2 and S2 yellow (in *P. feai*, markings on pronotum, mesopleuron, parategula, metanotum, propodeal valvula, T1, T2 and S2 ferruginous);

Plate VI



Figs. 31-33 *Parancistrocerus turensis* Girish Kumar & Carpenter sp. n. Holotype female, 31, Head & mesosoma dorsal view; 32, Metanotum & propodeum; 33, Metasoma dorsal view. Figs. 34-36 *P. vicinus* Giordani Soika female. 34, Body profile; 35, Head frontal view; 36, Clypeus.

white hairs (in *P. feai*, head and mesosoma with reddish golden hairs).

12. *Parancistrocerus vicinus* Giordani Soika, 1994 (Figs. 34-42)

Parancistrocerus vicinus Giordani Soika, 1994: 159 (key), 194, Holotype female, “India: Maharashtra, Matheran” (BMNH).

Plate VII



37



38



39



40



41



42

Figs. 37-42 *Parancistrocerus vicinus* Giordani Soika; 37-39 female. 37, Head & mesosoma dorsal view; 38, Metanotum & propodeum; 39, Metasoma. 40-42 male. 40, Body profile; 41, Head frontal view; 42, Antenna

Diagnosis: Female (Fig. 34): Dorsal face of propodeum fused at midline of metanotum, not forming horizontal area behind midline of metanotum (Fig. 38); T2 with almost regular apical yellow band, about 2 irregular rows of punctures at median area of yellow band (Fig. 39); punctures on T2 larger; T1 with narrow apical yellow band, about 2-3 irregular rows of

punctures at yellow band; clypeus (Fig. 36) longer, strongly emarginate at apex, with less acute apical teeth; clypeus with punctures of average thickness, interspaces about equal to punctures; vertical anterior face of T1 distinctly shorter than dorsal horizontal face; S2 convex at base, very weakly depressed after; T2 not reflexed at apex, with apical

margin normal, not prolonged in middle.

Colour description: Body black with yellow and brown ferruginous markings. Yellow markings: spot at base of mandibles; broad band at base and apex of clypeus; stain on frons above interantennal space; ocular sinus; mark on tempora; lower side of scape; wide band on dorsal surface of pronotum, interrupted medially; speck on top of mesepisternum; tegula (except median brown area); parategula; metanotum; apical mark on fore and mid femora; mark on all tibiae (sometimes absent in hind tibiae); almost regular apical bands on T1, T2 & S2. Brown ferruginous markings: lower face of funicles; mandibles and tegulae (excluding yellow portions); all tarsi. Wings almost hyaline, fore wing with subapical fuscous cloud.

Length (H+M+T1+T2): 6-7 mm.

Male (hitherto unknown) (Fig. 40): Clypeus more emarginate at apex than that of female (Fig. 41); apical antennal article pointed at apex and almost reaching to base of 11th article in curved position (Fig. 42). Colour similar to that of female except yellow marks on clypeus more extensive; yellow stain on front, above interantennal space, extended to base of clypeus. **Length** (H+M+T1+T2): 6 mm.

Material examined: INDIA: Kerala, Kozhikode Dist., Kotttooli wetland, 2♀, 15.v.2008, Coll. P.M. Sureshan & Party, ZSIK Regd. Nos. ZSI/WGRS/I.R-INV.6960 & 6961; Calicut town, 2♀, 23.ii.2012, Coll. K.P. Mohammed Shareef, ZSIK Regd. Nos. ZSI/WGRS/I.R-INV.6962 & 6963; Vayalada, 1♀ & 1♂, 21.ix.2012, Coll. K.P. Mohammed Shareef, ZSIK Regd. Nos. ZSI/WGRS/I.R-INV.6964 & 6965; Malabar Wildlife Sanctuary, Poozhithodu, Thalipara, 1♀, 18.iv.2013, Coll. P. Girish Kumar, ZSIK Regd. No. ZSI/WGRS/I.R-INV.6966; Nanminda, 1♀, 4.vi.2014, Coll. P. Girish Kumar, ZSIK Regd. No. ZSI/WGRS/I.R-INV.6967; Malabar Wildlife Sanctuary, Kakkayam, 1♀, 23.ii.2016, Coll. P. Girish Kumar, ZSIK Regd. No. ZSI/WGRS/I.R-INV.6968; Wayanad Dist., Sulthan Batheri, 1♀, 22.v.2012, Coll. Lambert Kishore, ZSIK Regd. No. ZSI/WGRS/I.R-INV.6969; Thirunelli, Brahmagiri shola forest, 1♀, 16.ii.2016, Coll. P. Girish Kumar, ZSIK Regd. No. ZSI/WGRS/I.R-INV.6970.

Distribution: India: Kerala (new record), Maharashtra.

Checklist of Oriental species of *Parancistrocerus* Bequaert

- (1) *P. acarophilus* Giordani Soika, 1994 — Philippines.
- (2) *P. acclivus* Gusenleitner, 2007 — Laos.
- (3a) *P. androcles androcles* (Meade-Waldo, 1910) — India: Kerala, Meghalaya, Tripura (new record); Sri Lanka; Myanmar; Thailand; Vietnam; Malaysia (including Sabah); Singapore; Indonesia: Sumatra, Java, Sulawesi; Philippines.
- (3b) *P. androcles marginalis* Giordani Soika, 1994 — Philippines.
- (3c) *P. androcles scutellaris* Giordani Soika, 1994 — Philippines.
- (3d) *P. androcles sulawensis* Giordani Soika, 1993 — Indonesia: Sulawesi.
- (3e) *P. androcles sumbanus* Giordani Soika, 1994 — Indonesia: Sumba.
- (4) *P. assamensis* (Meade-Waldo, 1910) — India: Meghalaya; Nepal; Myanmar; Laos; Vietnam.
- (5) *P. capocacciai* Giordani Soika, 1994 — Myanmar; Laos.
- (6) *P. citropictus* Giordani Soika, 1994 — Indonesia: Sulawesi.
- (7) *P. cylindricus* (de Saussure, 1862) — Indonesia: Sulawesi.
- (8) *P. cylindroides* Giordani Soika, 1994 — Indonesia: Sulawesi.
- (9a) *P. difformis difformis* Giordani Soika, 1994 — Malaysia: Sabah.
- (9b) *P. difformis nigerrimus* Giordani Soika, 1994 — Malaysia: Sabah.
- (10) *P. feai* Giordani Soika, 1994 — India: Sikkim; Myanmar; Malaysia.
- (11) *P. fulvipes fulvipes* (de Saussure, 1855) — U.S.A.; Mexico; Costa Rica; adventive in Midway Island.
- (12) *P. gracilior* Giordani Soika, 1995 — Indonesia: Sulawesi.
- (13) *P. holzschuhi* Gusenleitner, 1987 — India (new record): Arunachal Pradesh, Meghalaya; Nepal.
- (14) *P. hongkongensis* Gusenleitner, 2002 — China: Hong Kong.
- (15a) *P. incorruptus demens* Giordani Soika, 1972 — India: Sikkim.
- (15b) *P. incorruptus incorruptus* Giordani Soika, 1972 — India: Assam.
- (15c) *P. incorruptus kalimpongensis* Giordani

- Soika, 1994 — India: West Bengal.
- (16) *P. inflaticeps* Giordani Soika, 1994 — Indonesia: Java.
- (17) *P. insolitus* Gusenleitner, 2012 — Vietnam.
- (18) *P. intermediatus* (Sonan, 1939), NEW COMBINATION — Taiwan.
- (19) *P. irritatus* Giordani Soika, 1972 — India: Sikkim.
- (20) *P. jaferpaloti* Girish Kumar & Carpenter **sp. n.** — India: Kerala.
- (21) *P. kennethianus* Giordani Soika, 1994 — Malaysia: Sabah.
- (22) *P. kolambuganensis* (von Schulthess, 1934) — Philippines.
- (23) *P. kuraruensis* (Sonan, 1939), NEW COMBINATION — Taiwan.
- (24) *P. loharbandensis* Girish Kumar & Carpenter **sp. n.** — India: Assam.
- (25) *P. luzonicola* van der Vecht, 1981 — Philippines.
- (26) *P. makilingi* Giordani Soika, 1994 — Philippines.
- (27) *P. malayanus* Giordani Soika, 1994 — Malaysia.
- (28) *P. nigriventris* Giordani Soika, 1994 — Malaysia: Sabah.
- (29) *P. nitobei* (Sonan, 1939), NEW COMBINATION — Taiwan.
- (30) *P. pseudodynerus* (Dalla Torre, 1889) — Indonesia: Java.
- (31) *P. pseudallodynerus* Giordani Soika, 1994 — Malaysia: Sabah.
- (32) *P. reflexus* Gusenleitner, 2011 — Laos.
- (33) *P. rhipheus* (Cameron, 1904) — India: West Bengal; Laos.
- (34a) *P. robertianus javanus* Giordani Soika, 1994 — Indonesia: Java.
- (34b) *P. robertianus palawanensis* Giordani Soika, 1993 — Philippines.
- (34c) *P. robertianus robertianus* (Cameron, 1903) — Malaysia: Sarawak; Indonesia: Sumatra.
- (35) *P. samarensis* (von Schulthess, 1934) — Laos; Philippines.
- (36) *P. siamensis* Gusenleitner, 2003 — Thailand.
- (37) *P. simoni* Gusenleitner, 2013 — Laos.
- (38) *P. sulcatus* Giordani Soika, 1994 — Thailand; Laos.
- (39) *P. taihorinensis* (von Schulthess, 1934) — Taiwan.
- (40) *P. taihorinshoensis* (von Schulthess, 1934) — Taiwan.
- (41) *P. taikonus* (Sonan, 1939), NEW COMBINATION — Taiwan.
- (42a) *P. triconcavus rufipes* Giordani Soika, 1994 — Indonesia: Sumba.
- (42b) *P. triconcavus triconcavus* Giordani Soika, 1994 — Indonesia: Sulawesi.
- (43) *P. turensis* Girish Kumar & Carpenter **sp. n.** — India: Meghalaya.
- (44) *P. vicinus* Giordani Soika, 1994 — India: Kerala (new record), Maharashtra.
- (45a) *P. yachowensis konkunesis* Giordani Soika, 1994 — Taiwan.
- (45b) *P. yachowensis yachowensis* Giordani Soika, 1986 — China; Laos.
- (46) *P. yamanei* Gusenleitner, 2000 — Taiwan.

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A new species of genus *Ceropupa* from Luzon, Philippines (Hemiptera: Derbidae: Sikaianini), with a key to the species of *Ceropupa* Emeljanov, 1996

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Abstract

The genus *Ceropupa* Emeljanov, 1996 is reported for the first time from the Philippines and a new species, *C. adams* is added to the Philippine derbid fauna. This new species differs from the other species by the presence of the following characters: basal half of costal vein with three white spots, apical part have 10 red transverse veins, base of tegmen to half-length of clavus not entirely darkened, with pale spots $\frac{1}{4}$ before $\frac{1}{2}$ of clavus, and apical part of wing entirely darkened. An identification key, photos of habitus and male genitalia, type habitat, and host plant are given.

Keywords: *Ceropupa*, *Derbidae*, *Philippines*, *new species*, *new country record*

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Introduction

The family Derbidae represents the third largest family of the Fulgoromorpha after Delphacidae and Cixiidae with about 160 genera and 1600 species (Bourgoïn, 2016). It was established by Spinola in 1839 but it was only in 1917 that F. Muir was able to comprehensively collect and study them in the Philippines. Muir (1917) noted that the derbid fauna is very rich in the Philippines. This was supported by Zelazny (1981) during his survey in the Philippines on sucking insects feeding on coconut palms, and he reported 1 new genus and 44 new species and proposed 6 new combinations in the tribe Rhotanini. Since Zelazny's comprehensive work on the tribe Rhotanini, there is very little information that has been published on other tribes of Philippine Derbidae.

Sikaianini has the least number of species being described among the tribes of the subfamily Otiocerinae. Distribution covers Afrotropical, Australasian, Indo-Malayan, Nearctic, and Neotropical regions. It is composed of six genera and 33 species

(Bourgoïn, 2016). Most genera are well represented in the Philippines.

Muir (1917) distinguished Sikaianini from other derbid tribes by the following set of characters: subcostal cell very short or absent; eyes in front reaching to base of clypeus; and female with genital styles abortive. The first Philippine sikaianine species to be described was *Sikaiana makii* Muir, 1915. The other seven species were described by Muir (1917) together with the establishment of the tribe. Since the establishment of the Sikaianini in 1917, no other work has been done on this tribe in the country.

Adams is the northernmost town of Ilocos Norte bounded by neighboring towns in Ilocos Norte (Pagudpud, Dumalneg, Venter); Calanasan, Apayao, and Santa Praxedes, Cagayan. It is located at 18°28' N 120°54' E. The highest peak of Mt. Pao is around 1,340 meters above sea level (Figure 1). It is part of the northern portion of the Cordillera Mountains (Brown *et al.*, 2012). At present, assessment of vegetation of Mt. Pao is lacking. The following



Figure 1: Mt. Pao, Adams, Ilocos Norte, type locality of *Ceropupa adams* sp. n.
(Photo courtesy of Ace Amarga)

description is based mainly on the lead author's observations during field work. It is a less disturbed tropical lower montane forest. As you enter deep into the forest, the crowns become overlapping, limiting the entry of sunlight. Species that are not shade-tolerant thrive only at the edges of rivers, creeks and streams. The species below the trees rely only on crown gaps for their light requirements. Brown *et al.* (2012) showed some photographs of the inner portion of the forest. The forest floor is inhabited by ferns, vines, saplings, seedlings, pandans, palms and herbs.

Materials and Methods

Adult planthoppers were collected using an insect net and aspirator. Specimens were killed using a cyanide bottle. Collected specimens were brought to the laboratory for preservation and identification. Adults were mounted on insect pins or paper points. All specimens were labelled properly with respect to

locality, date of collection and collector. Direct observations and dissection of specimens have been made using dissecting microscope. Wing terminologies followed Bourgoin *et al.* (2014). Voucher specimens and types were deposited at the Museum of Natural History-UPLB (UPLBMNH).

Key to the species of *Ceropupa*

1. Basal half of costal vein with two white spots, base of tegmen to half-length of clavus entirely darkened, with no pale spots $\frac{1}{4}$ before $\frac{1}{2}$ of clavus, apical part of wing with one pale spot between veins of RP and M ***C. trismegista* Emeljanov, 1996**
- Basal half of costal vein with three white spots, apical part have 10 red transverse veins, base of tegmen to half-length of clavus not entirely darkened, with pale spots $\frac{1}{4}$ before $\frac{1}{2}$ of clavus, apical part of wing entirely darkened ***C. adams* sp. n.**

Genus *Ceropupa* Emeljanov, 1994

Ceropupa Emeljanov, 1996: 94.

Type species: *Ceropupa trismegista* Emeljanov, 1996, Entom. Rev. 75(2): 94. Ha Shon Bing, Hoa Bing, and Cao Phong Provinces, Vietnam

***Ceropupa adams* Yap and Bourgoïn sp. n.**
(Figs. 2-8)

[urn:lsid:zoobank.org:pub:940B66E4-50EC-4300-B2E4-758CB72C8903](https://zoobank.org/pub:940B66E4-50EC-4300-B2E4-758CB72C8903)

Diagnosis: In general, the form and color are very similar to those of the type species, *C. trismegista* from Vietnam. However, *C. adams* has the basal half of costal vein with three white spots, apical part have 10 red transverse veins, base of tegmen to half-length of clavus not entirely darkened, with pale spots $\frac{1}{4}$ before $\frac{1}{2}$ of clavus, and apical part of wing entirely darkened.

Description: Minute species. Head dorsally narrower than pronotum; laterally, apex of vertex at level with or slightly projecting in front of eyes; base of vertex as wide as long; junction of vertex and frons laterally angulate; base of clypeus laterally straight; ventral margin of eyes incised; scape shorter than wide; pedicel as long as face, not flattened, unbranched; small sensory plate organs present on antennae; stenosis of antenna at middle; arista subterminal; pronotum broad, posterior margin with shallow notch at middle, median carinae 3-carinate; mesonotum large without carinae; subcostal cell absent; M forked near or middle of tegmen; median cell reaching middle of tegmen; C1 present; CuA separated with M; base of C3 shorter than length of C4; claval veins barely distinct; hindwings not more than half as long as tegmina, ampliate; Cu1 of hindwing unbranched. Female genitalia reduced.

Colour. Body yellowish or reddish brown to dark brown; head, including antennae, dark brown to black and proboscis white. Pronotum entirely dark brown. Mesonotum and metanotum dark brown. Scutellum yellowish brown to reddish yellow. Thorax ventrally reddish brown. Legs yellow. Costal veins of forewings red.

Basal half of costal area entirely darkened. Abdomen dorsally light brown, venter dark brown, lateral regions reddish.

Male genitalia: Lateral margin of pygofer angulate, median process single and concave; gonostylus twice as long as wide at widest point, apex hook-like; inner ventral margin of paramere convex; anal tube convex, shorter than gonostyle.

Body length: 1.8 mm

Forewing: 5.0 - 6.0 mm

Type material: PHILIPPINES: LUZON: Ilocos Norte: Holotype, male, Mt. Pao, Adams, N18°26'44.0", E120°52'53.3", 617m asl, *Pinanga urosperma*, 22-vi-2011, SAYap and MVYngente, UPLBMNH HEM-02266

Other material examined: PHILIPPINES: LUZON: Ilocos Norte: 1♀, Mt. Pao, Adams, N18°26'44.0", E120°52'53.3", 617m asl, *Pinanga urosperma*, 22-vi-2011, SAYap and MVYngente, UPLBMNH HEM-02267.

Type locality: Philippines, Luzon, Ilocos Norte

Distribution: Philippines, northern Luzon

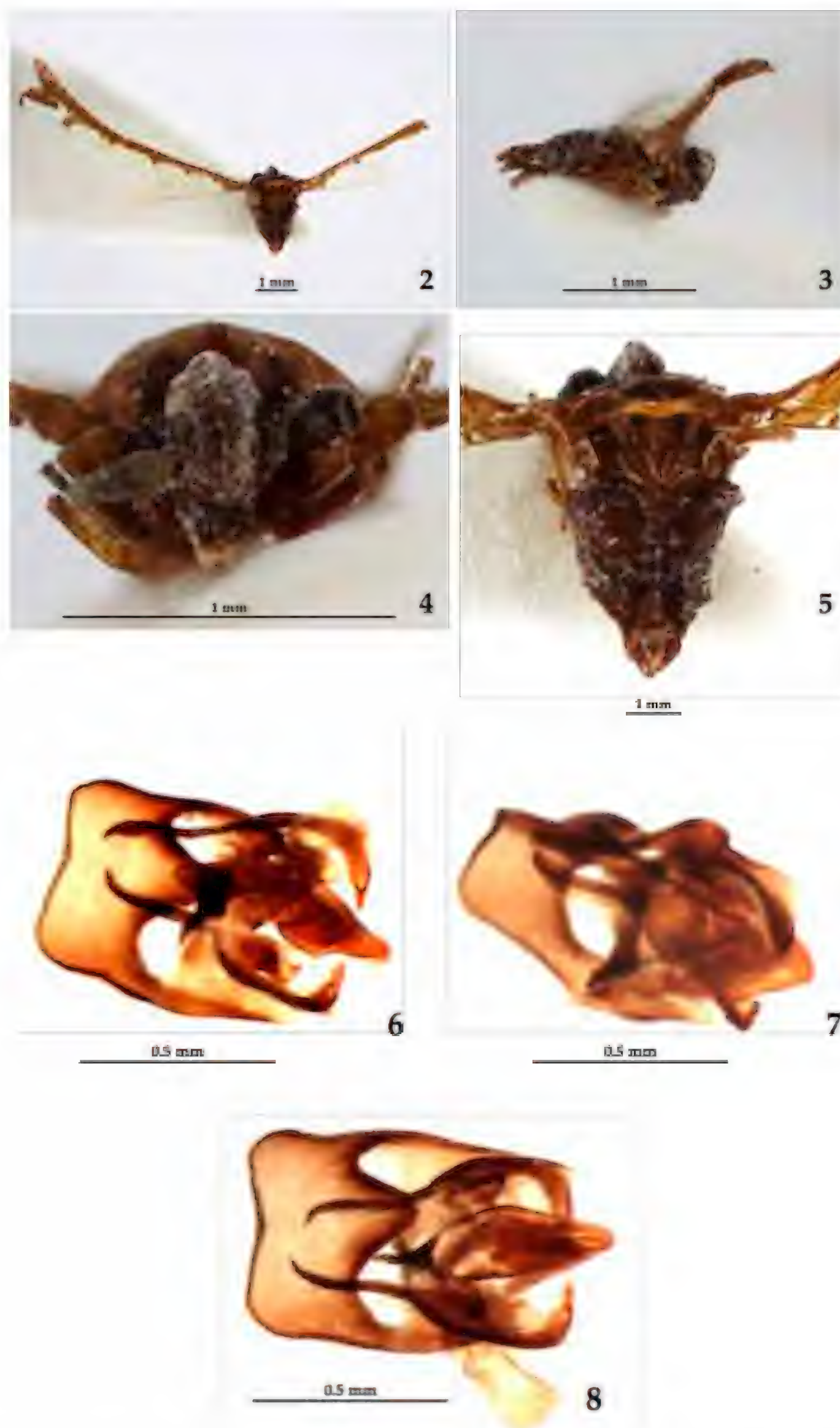
Etymology: The species refers to the type locality and is treated as a noun in apposition.

Habitat and life history traits (Fig 9): *C. adams* thrives in a dipterocarp forest in northern part of Luzon Island. It is found underneath the leaves of *Pinanga urosperma* Becc.

Discussion

The recent discovery of a new species was thought to be a new genus. However, further research and morphological analysis revealed that it belongs to genus *Ceropupa* described by Emeljanov (1996) based on a female specimen from Ha Shon Bing, Hoa Bing, and Cao Phong Provinces, Vietnam. Emeljanov (1996) compared the genus with *Leomelicharia* Muir, *Distantinia* Muir, and *Muiria* Kirkaldy.

In the present paper, a new species of *Ceropupa*, *C. adams* is described and reported for the first time in the country. This contribution provides an additional record



Figures 2-5: *Ceropupa adams* sp. n. (holotype): 2. habitus, dorsal view; 3. habitus, lateral view; 4. head, frontal view; 5. thorax and abdomen, dorsal view.

Figures 6-8: *Ceropupa adams* sp. n. male genitalia: 6. dorsal view; 7. lateral view; 8. ventral view. (Images taken by Laurent Fauvre)



Figure 9: *Pinanga urosperma* Becc., type host plant of *Ceropupa adams* sp. n.

making the tribe Sikaianini well represented in the country, with five genera and nine species.

Records of host plants in the tribe Sikaianini were all unidentified. However, the lead author was able to observe and gather data during field work. *Ceropupa adams* were collected and observed feeding in *Pinanga urosperma*.

The Philippines is among the richest regions in the world in terms of flora and fauna. It is considered as a site of megadiversity in the world. With its 7,107 islands, the Philippines is

the most promising region where a great diversity of small and delicate insects including the family Derbidae, could be found. Furthermore, having observed feeding on palms, a detailed study should be done on the specific host plant associations of derbids on palms.

Acknowledgements

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Influence of the sugar-loving ant, *Camponotus compressus* (Fabricius, 1787) on soil physico-chemical characteristics

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Abstract

The present study focuses on the physico-chemical characteristics of the nest rim debris soil of a common, abundant, plant-visiting ant, *Camponotus compressus* (Fabricius, 1787). The results reveal that the colonies influence the nutrient content and the texture of the debris soil. The nest debris had significantly higher proportion of large-sized soil particles, along with higher total N, P, NO₃-N, and moisture content but lower concentrations of total C and NH₄-N as compared to the control soil. *Camponotus compressus* nests annually contributed about 3.1361 Kg of C, 1.5482 Kg of N, 0.05853 Kg of P, 0.14457 Kg of NO₃-N and 0.1744 Kg of NH₄-N per hectare via the debris soil of the long-lived primary nests. The short-lived satellite nests contributed, 1.7868 Kg of C, 0.7955 Kg of N, 0.0318 Kg of P, 0.0559 Kg NO₃-N and 0.09623 Kg of NH₄-N per hectare, annually. Thus, the activities of *C. compressus* colonies contribute to soil nutrient enhancement, alter the soil particle size distribution, shift the soil pH towards neutral and through their frequent satellite nest construction activities and enhance soil porosity. Since *C. compressus* is abundant in a variety of ecosystems including annual cropping systems, its nesting activities are suggested to enhance ecosystem productivity.

Keywords: *Ant nests, soil texture, soil nutrients, nutrient content.*

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Introduction

Soil health is essential for proper ecosystem functioning, for providing supporting ecosystem services (McBratney *et al.*, 2014) and increasing agricultural productivity. The role of soil fauna in influencing the quality of nutrient cycling, soil nutrients, water use efficiencies and agricultural sustainability has recently gained a great deal of attention (Brussaard *et al.*, 2007; Bender and van der Heijden, 2014). An important challenge in agro-ecosystem research is to understand the role of soil organisms as ecosystem engineers (Folgarait, 1998; Sanders *et al.*, 2014). Many ground-dwelling invertebrates such as earthworms, termites and ants, are ecosystem engineers which influence the food web structure and soil nutrients (Frouz and Jílková, 2008; Blouin, *et al.*, 2013; Shukla *et al.*, 2013). Extensive studies have been carried out on nutrient recycling, soil formation and

structural modification of the soil by these ecosystem engineers. Significant increase in the mineralogical properties of mounds/nests built by termites and ants has been reported (Leprun and Roy-Nöel, 1976; Boyer, 1982; Mahaney *et al.*, 1999). Nest excavation activities of ground-nesting ant species modify the soil by inversion of the soil layers while the nest chambers and galleries enhance soil porosity and aeration. Further, the colonies of many ant species dump plant and/or animal based refuse along with excreta, outside the nests (Frouz and Jílková, 2008; Shukla *et al.*, 2013). Moreover, one of the most conspicuous nest cleaning activities of ant colonies is the removal and dumping of dead nest-mates outside the nest (Wheeler, 1926; Wilson *et al.*, 1958; Banik *et al.*, 2010) which further enriches the nest rim debris soil. The debris generating activities of ant colonies in

concert with the organic matter decomposing soil microorganisms regulate the physical and chemical processes which affect soil fertility and counteract the processes of soil degradation (Lee and Foster, 1991; Eldridge and Pickard, 1994). While the physical changes are related to the soil texture, the chemical changes vary with the soil characteristics or the ant species involved (Mc Ginley *et al.*, 1994). Since many ant species relocate their nest sites infrequently (Gordon, 1992) the nutrient accumulation continues for decades and sometimes even persist for a considerable time after nest abandonment (Wagner *et al.*, 1997, 2004). In deciduous temperate forests, the influence of the European red wood ant, *Formica polyctena*, a mound-forming species with below-ground nests, on soil nutrients was detectable >20 years after abandonment (Kristiansen and Amelung, 2001). Such species can therefore have a lasting impact on nutrient heterogeneity in the landscape. Majority of investigations related to ant nest soil characteristics have documented the modifications in the nest chamber soil (Farji- Brener and Silva, 1995; Wagner, 1997; Kristiansen and Amelung, 2001; Moutinho *et al.*, 2003; Verchot *et al.*, 2003; Dostál *et al.*, 2005; Cerdà and Jurgensen, 2011; Jílková *et al.*, 2011; Kotova *et al.*, 2015), and very few have studied the impact of their activities on the physico-chemical properties of the external debris pile soil (Gordon, 1992; Shukla *et al.*, 2013).

The present study focuses on the physico-chemical characteristics of the ant nest crater rim debris soil of a locally common and abundant, plant-visiting carpenter ant, *Camponotus compressus* (Fabricius, 1787). Carpenter ants belong to the hyperdispersed genus *Camponotus* which includes polydomous species (Pfeiffer and Linsenmair, 1998; Buczkowski, 2011). Carpenter ant colonies are known to construct two types of nests: the primary nests and the associated satellite nests (Orr *et al.*, 1996). *Camponotus compressus* is common in South and Southeast Asia, including India (Veena and Ganeshiah, 1991; Bharti, *et al.*, 2016; Nettiimi and Iyer, 2015). The nests of this species are found to occur in a wide variety of ecosystems including annual and perennial agroecosystems (Rastogi, 2004; Agarwal *et al.*, 2007).

A question very frequently raised (Frouz and Jílková, 2008) is: do ants really alter the soil or do they select soil spots with specific conditions to build their nests? Hence, in the present study we selected 3 study sites to find how the nest excavation and maintenance activities of *Camponotus compressus* colonies influence the soil in different areas. The following questions were addressed: i) What is the nutrient content of the debris soil from the 3 study areas? ii) What are the physical changes in the debris soil, in terms of the soil particle size? iii) What would be the annual contribution of *Camponotus compressus* nests in influencing soil nutrients?

Materials and Methods

Study site and system

The study on the physico-chemical characteristics of ant nest debris soil (hereafter referred to as the debris soil) was conducted from samples collected from 3 study sites: the Ayurvedic garden (AG), the Botanical garden (BG), and the unpaved roadside areas (RS). All the 3 sites are rich in plant diversity (Dubey, 2004) and are located within Banaras Hindu University campus of Varanasi, (25°18' N, 83°01' E) in Uttar Pradesh, India.

Camponotus compressus colonies make underground nests but the worker ants visit the extrafloral nectary-bearing plants for collecting nectar and honeydew, produced by plant - associated homopterans (Way, 1963; Agarwal and Rastogi, 2008, 2009).

Soil sample collection

Debris soil samples of the primary and the satellite nests were collected from the entrance rim of the active nests of *C. compressus*, from each of the 3 study sites. The soil samples (approximately 500 gm of each) were collected from the control site nest rim debris piles of the primary and satellite nests and put inside plastic bags. The control soil samples were collected from areas (n = 5) located at least 5 m away from any ant nest and was free from any type of vegetation. The control samples collected from a particular site were thoroughly mixed to yield one composite sample per study site.

Determination of the physico-chemical characteristics of soil

Soil samples were passed through a 2 mm sieve and analyzed according to the following methods: Fresh soil was used for analysis of ammonium-nitrogen ($\text{NH}_4\text{-N}$), nitrate-nitrogen ($\text{NO}_3\text{-N}$), pH and moisture content (MC). However, only dry soil was used for determination of the total Carbon, total Nitrogen (Kjeldahl N), and total Phosphorus.

Particle size distribution in experimental and control soil samples were analyzed by using a simple and rapid quantitative method developed by Kettler *et al.* (2001), and a combination of sieving (4 different mesh sizes: 2.0, 1.0, 0.5 and 0.2 mm of sieves used) method. Soil pH was measured in 1:2.5 mixture of soil and distilled water. Soil and water were mixed and after 30 minutes pH was recorded using a pH meter.

Total Nitrogen was determined by the micro-Kjeldahl method (Jackson, 1958). Ammonium Nitrogen ($\text{NH}_4\text{-N}$) was extracted by KCl and analyzed by the phenate method (APHA, 1985). $\text{NO}_3\text{-N}$ was measured by Phenol disulphonic acid method using Calcium sulphate as an extractant (Jackson, 1958). Total P was determined through Aqua regia ($\text{HClO}_4\text{: HNO}_3\text{: H}_2\text{SO}_4 = 1\text{:}5\text{:}1$) digestion by phosphomolybdic acid blue colour method (Jackson, 1958).

Debris accumulation at the entrance rim of *C. compressus* active nests and soil nutrient changes per 100 m² area

Data pertaining to the duration of nest use by an ant colony, number of nests per unit area and quantity of debris accumulated per nest by *C. compressus* colonies, were collected from each of the 3 study sites and pooled for this part of the study. Ant nest age was assessed by monitoring each nest at fortnightly intervals. Number of nests per unit area was recorded in an area of 2000 m² per site.

To investigate the amount of debris accumulated per nest/month, 10 nests of each type (primary/satellite nests/site) were monitored from June, 2011 to May, 2012. Nest debris pile soil was collected from each nest per month, brought to the laboratory and its weight was recorded.

Data analysis

Analysis of variance (one way ANOVA) followed by Dunnett's *post-hoc* test was used to assess variations in the physical and chemical properties of the nest debris soil and also the variations in the soil properties due to site differences. The statistical software SPSS-16 was used.

Results

Nest location

Primary nests were found at or near a plant (shrub/tree) base while the satellite nests were located at a distance (range: 0.25 to 5 m) around each primary nest. The numbers of associated satellite nests per primary nest varied from 1 to 14. The life span of a primary nest was 6 month to 4 years (Some nests are active from June 2011 till date) while that of a satellite nest was 15 days to 4 months.

Physico-chemical characteristics of the debris soil

Soil particle size

Significant differences were found in the soil particle size categories of the debris and control soil. The percentage of large size particles (2.0-1.0 mm & 1.0-0.5 mm) was significantly higher ($p < 0.001$) in the debris soil from all the 3 sites (the exception being the BG debris in which the value though higher was not significantly so, in case of the 1.0-0.5 mm category). Moderate size particles (0.5- 0.2 mm) were found to be less (significantly less only in BG debris, $p < 0.01$) as compared to the control soil. The percentage of small size particles ($< 0.2\text{mm}$ category) was lower ($p < 0.001$ in case of BG and RS) in nest debris from each of the 3 sites as compared to the control soil (Table 1).

The debris soil of both primary and satellite nests had lower pH value as compared to the respective control soil (Table 2). Debris soil moisture content was higher in case of each of the 2 types of nests from each of the 3 sites. The value was significantly higher ($p < 0.01$ and $p < 0.001$) for the primary and satellite nest debris from AG sites although significant differences were not found in BG and RS debris soil as compared to the respective control, from each site.

Table 1. Soil particle size (Mean \pm SEM) of the control and nest debris soil of *Camponotus compressus* ants from 3 study sites: Ayurvedic and Botanical gardens and the unpaved roadside areas collected during June, 2011 to May, 2011, from Banaras Hindu University campus, Varanasi, India

Particle size range (mm)	Soil particle size (%)					
	Sites					
	Ayurvedic Garden		Botanical Garden		Roadside pavements	
	Control	Debris	Control	Debris	Control	Debris
2.0 - 1.0	4.256 \pm 0.25	30.04 \pm 1.85***	3.935 \pm 0.41	42.56 \pm 5.27***	3.129 \pm 0.39	32.17 \pm 1.2***
1.0 - 0.5	45.719 \pm 0.83	28.49 \pm 2.36***	45.878 \pm 0.93	36.37 \pm 4.67	44.542 \pm 1.44	27.99 \pm 1.84***
0.5– 0.2	26.469 \pm 1.4	27.81 \pm 2.01	26.565 \pm 1.44	16.24 \pm 1.82**	27.047 \pm 1.11	27.02 \pm 2.13
< 0.2	23.556 \pm 1.17	13.66 \pm 3.86	23.622 \pm 1.11	4.83 \pm 1.55***	25.282 \pm 1.33	12.82 \pm 2.8***

(Dunnett's *post hoc* test: * $p < 0.05$, ** $p < 0.01$ and *** $p < 0.001$)

Debris soil from both types of nests had lower C content than the control soil, from each of the 3 sites (Fig. 1a). Significantly lower ($p < 0.001$ for each case) C concentrations were found in the primary and satellite nest debris soil from the BG area. The value was least significant ($p < 0.05$) in case of debris samples of satellite nests from the RS area. However, no significant differences were found in the C content in AG debris soil as compared to the control. Total N content was found to be consistently higher in both the primary and satellite nest debris as compared to the control soil, from each of the 3 sites (Fig. 1b). The total N value was significantly higher ($p < 0.01$ and $p < 0.5$) in the primary and satellite nest debris from the AG site and the value was least significant ($p < 0.05$) in case of debris from the primary nests of the BG area. However, no significant differences were found in the N content in BG satellite nest and RS primary and satellite nest debris soil as compared to the control. Total P content was found to be consistently higher in the primary and satellite nest debris soil (Fig. 1c), while no significant difference (with the exception of BG primary nest debris, $p < 0.05$) was found in the debris soil as compared to the control. Debris soil from both types of nests, from each of the 3 sites had higher concentration (values being significant in case of AG satellite nest debris, $p < 0.01$; BG primary nest debris, $p < 0.001$ and RS primary nest debris, $p < 0.05$) of $\text{NO}_3\text{-N}$ as compared to the control (Fig. 1d). The debris concentration of

$\text{NH}_4\text{-N}$ was found to be significantly lower (AG primary and satellite nest: $p < 0.001$, BG and RS satellite nests: $p < 0.05$) (Fig. 1e). However, no significant differences were found in BG and RS primary nest debris soil.

Debris accumulation at the entrance rim of *C. compressus* active nests and soil nutrient changes per 100 m² area

The mean number of active primary nests from each of the 3 study sites per month /100 m² ranged between 0.558 and 1.783 (AG: 0.558 \pm 0.06, BG: 0.675 \pm 0.034 and RS: 1.783 \pm 0.02), while the number of satellite nests ranged between 1.125 and 3.575 (AG: 1.125 \pm 0.122, BG: 1.592 \pm 0.22 and RS: 3.575 \pm 0.46). The amount of debris/nest/month generated by *C. compressus* primary nest was 0.788 \pm 0.11, 1.054 \pm 0.16 and 0.727 \pm 0.08 kg while for satellite nest the amount was 0.262 \pm 0.013, 0.267 \pm 0.01 and 0.234 \pm 0.01 kg, for AG, BG and RS sites, respectively.

The amount of debris/month/100 m² accumulated by *C. compressus* primary nests was 0.477 \pm 0.12, 0.727 \pm 0.12 and 1.297 \pm 0.14 kg while that accumulated by the satellite nests was 0.30 \pm 0.04, 0.424 \pm 0.06 and 0.856 \pm 0.133 kg, for AG, BG and RS sites, respectively. There were significant differences between the primary and satellite nests in the amount of nutrients generated/nest/month/100m², being higher in the primary nest debris as compared to the satellite nest debris (Table 3).

Influence of the sugar-loving ant, *Camponotus compressus* on soil physico-chemical characteristics

Table 2. Physico-chemical characteristics (Mean \pm SEM) of the control and nest debris soil of *Camponotus compressus* ants, from 3 study sites: Ayurvedic and Botanical gardens and the unpaved roadside areas collected during June, 2011 to May, 2011, from Banaras Hindu University campus, Varanasi, India

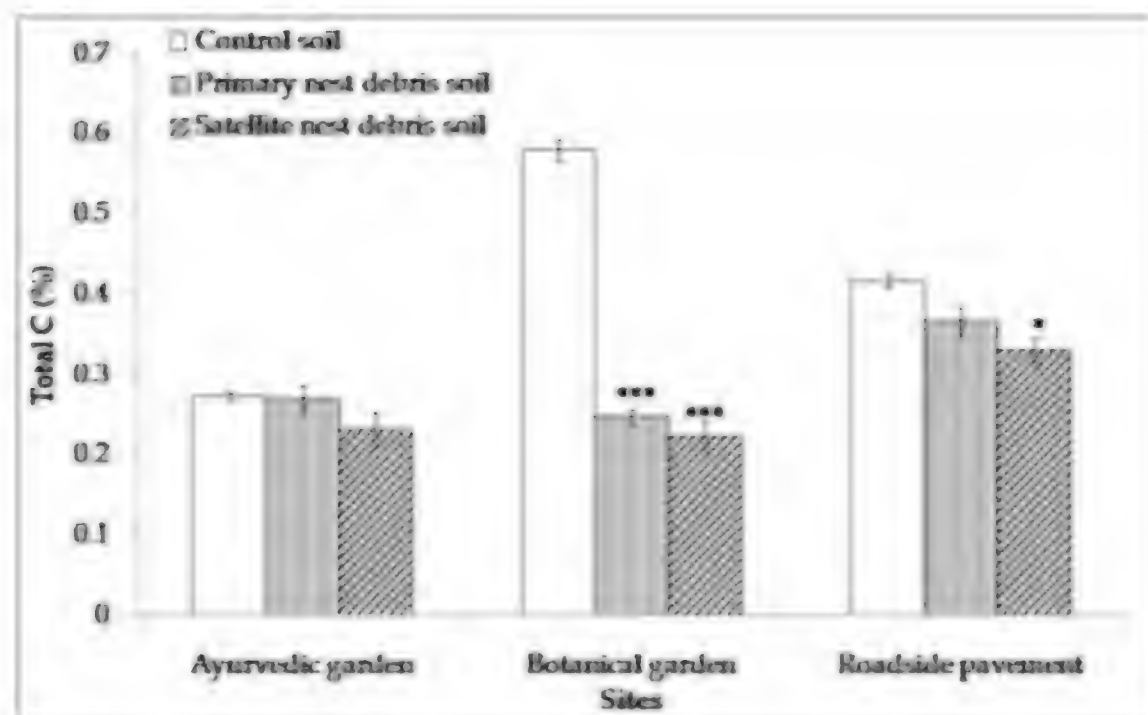
Parameter	Sites								
	Ayurvedic Garden			Botanical Garden			Road side Pavement		
	Control soil	Nest debris soil		Control soil	Nest debris soil		Control soil	Nest debris soil	
		Primary	Satellite		Primary	Satellite		Primary	Satellite
pH	8.14 \pm 0.02	7.99 \pm 0.02	7.98 \pm 0.05	7.62 \pm 0.016	7.48 \pm 0.04	7.44 \pm 0.01	7.71 \pm 0.01	7.53 \pm 0.06	7.51 \pm 0.03
Moisture Content (%)	1.75 \pm 0.03	2.308 \pm 0.13**	1.118 \pm 0.01***	1.72 \pm 0.05	2.25 \pm 0.13	1.91 \pm 0.18	1.54 \pm 0.6	2.09 \pm 0.157	2.10 \pm 0.60
C:N	6.68 \pm 4.68	3.02 \pm 0.34**	2.33 \pm 0.15***	6.05 \pm 0.396	2.02 \pm 0.20***	2.07 \pm 0.21***	3.13 \pm 0.06	2.998 \pm 0.31	2.62 \pm 0.28
N:P	14.23 \pm 1.24	18.25 \pm 1.63	19.05 \pm 1.27	21.71 \pm 1.65	23.67 \pm 2.33	21.08 \pm 1.18	29.60 \pm 3.23	53.52 \pm 18.49	32.79 \pm 3.55
C:P	64.15 \pm 3.05	50.52 \pm 4.56	45.26 \pm 4.65*	128 \pm 6.6	42.18 \pm 1.94***	42.07 \pm 3.58***	92.46 \pm 9.72	87.78 \pm 12.66	74.01 \pm 4.99
NO ₃ -N: NH ₄ -N	0.05 \pm 00	0.23 \pm 0.04	0.28 \pm 0.05*	0.09 \pm 0.0	0.82 \pm 0.159**	0.405 \pm 4.04	0.42 \pm 0.0	1.08 \pm 0.06	0.99 \pm 0.23

(Dunnett's *post hoc* test: * p < 0.05, ** p < 0 .01 and *** p < 0.001)

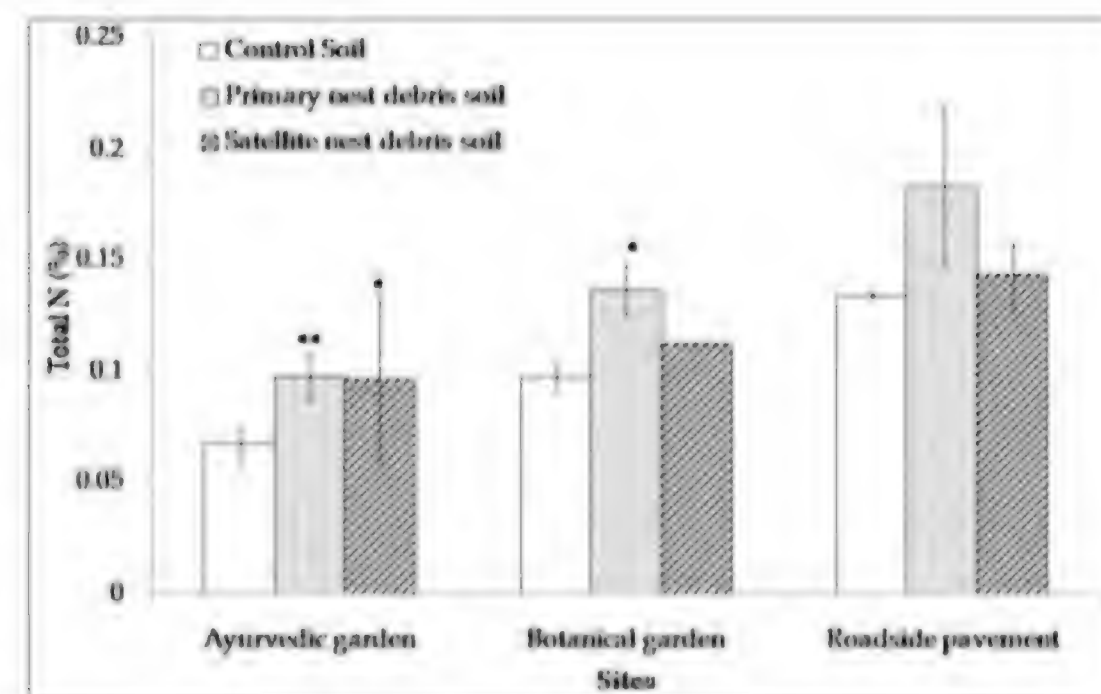
Table 3. Soil nutrients value (Mean \pm SEM) in the debris soil of the primary and satellite nests of *Camponotus compressus* ants from 3 study sites: Ayurvedic garden (AG), Botanical garden (BG) and unpaved roadside areas (RS) collected during June, 2011 to May, 2011, from Banaras Hindu University campus, Varanasi, India

Nutrients	Sites	Primary nest			Satellite nest		
		Nutrients/ nest/month (gm)	Nutrients/ month/100 m ² (gm)	Nutrients/year /hectare (Kg)	Nutrients/nest /month (gm)	Nutrients/month /100 m ² (gm)	Nutrients/year/ hectare (Kg)
Total C	AG	2.1258 \pm 0.282	1.2874 \pm 0.318	1.5448 \pm 0.382	0.6080 \pm 0.030	0.6964 \pm 0.088	0.8357 \pm 0.106
	BG	2.6133 \pm 0.388	1.8024 \pm 0.296	2.1629 \pm 0.355	0.5945 \pm 0.027	0.9456 \pm 0.137	1.1347 \pm 0.164
	RS	2.6599 \pm 0.289	4.7504 \pm 0.527	5.7005 \pm 0.633	0.7715 \pm 0.031	2.8249 \pm 0.439	3.3899 \pm 0.528
Total N	AG	0.8273 \pm 0.11	0.5010 \pm 0.124	0.6012 \pm 0.149	0.2529 \pm 0.013	0.2897 \pm 0.037	0.3476 \pm 0.044
	BG	1.4415 \pm 0.214	0.9942 \pm 0.163	1.1931 \pm 0.195	0.2986 \pm 0.014	0.4749 \pm 0.069	0.5699 \pm 0.082
	RS	1.3299 \pm 0.145	2.3752 \pm 0.264	2.8503 \pm 0.317	0.3343 \pm 0.014	1.2241 \pm 0.191	1.469 \pm 0.229
Total P	AG	0.0477 \pm 0.006	0.0289 \pm 0.007	0.0346 \pm 0.008	0.0138 \pm 0.001	0.0158 \pm 0.001	0.0189 \pm 0.002
	BG	0.0632 \pm 0.009	0.0436 \pm 0.007	0.0523 \pm 0.008	0.0148 \pm 0.001	0.0235 \pm 0.003	0.0282 \pm 0.004
	RS	0.0414 \pm 0.004	0.0739 \pm 0.008	0.0887 \pm 0.009	0.01099 \pm 0.00	0.0402 \pm 0.006	0.0483 \pm 0.007
NO ₃ -N	AG	0.0255 \pm 0.003	0.0155 \pm 0.004	0.0186 \pm 0.004	0.0103 \pm 0.001	0.0118 \pm 0.001	0.0142 \pm 0.002
	BG	0.0637 \pm 0.009	0.0439 \pm 0.007	0.0527 \pm 0.009	0.0069 \pm 0.000	0.0109 \pm 0.001	0.0132 \pm 0.001
	RS	0.1691 \pm 0.018	0.3020 \pm 0.033	0.3624 \pm 0.040	0.0319 \pm 0.001	0.117 \pm 0.018	0.1404 \pm 0.022
NH ₄ -N	AG	0.1403 \pm 0.019	0.0849 \pm 0.021	0.1019 \pm 0.025	0.0440 \pm 0.002	0.0505 \pm 0.006	0.0605 \pm 0.008
	BG	0.0900 \pm 0.013	0.0621 \pm 0.010	0.0745 \pm 0.012	0.0181 \pm 0.001	0.0288 \pm 0.004	0.0345 \pm 0.005
	RS	0.1618 \pm 0.018	0.2890 \pm 0.032	0.3468 \pm 0.039	0.0441 \pm 0.002	0.1615 \pm 0.025	0.1937 \pm 0.030

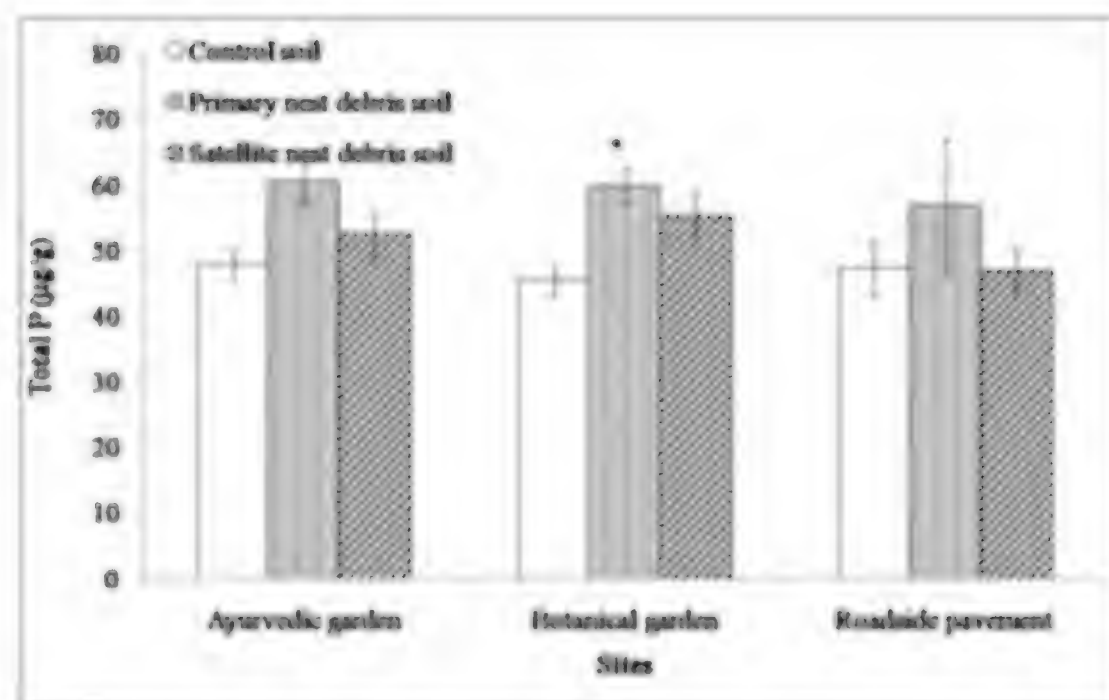
Influence of the sugar-loving ant, *Camponotus compressus* on soil physico-chemical characteristics



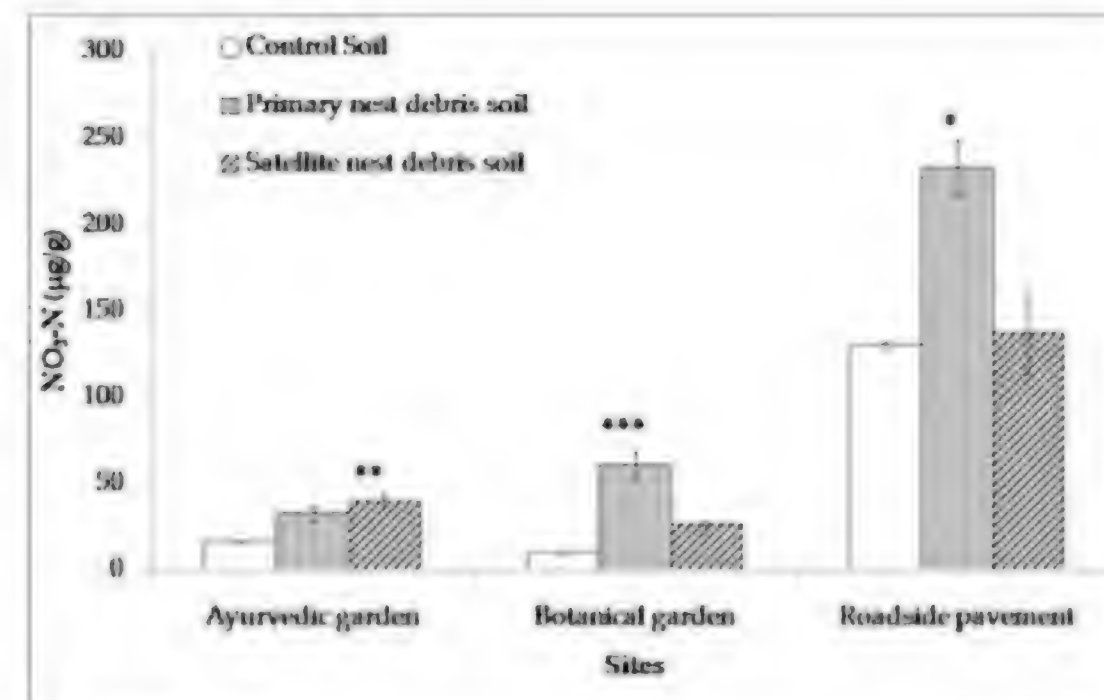
I (a)



I (b)



I (c)



I (d)

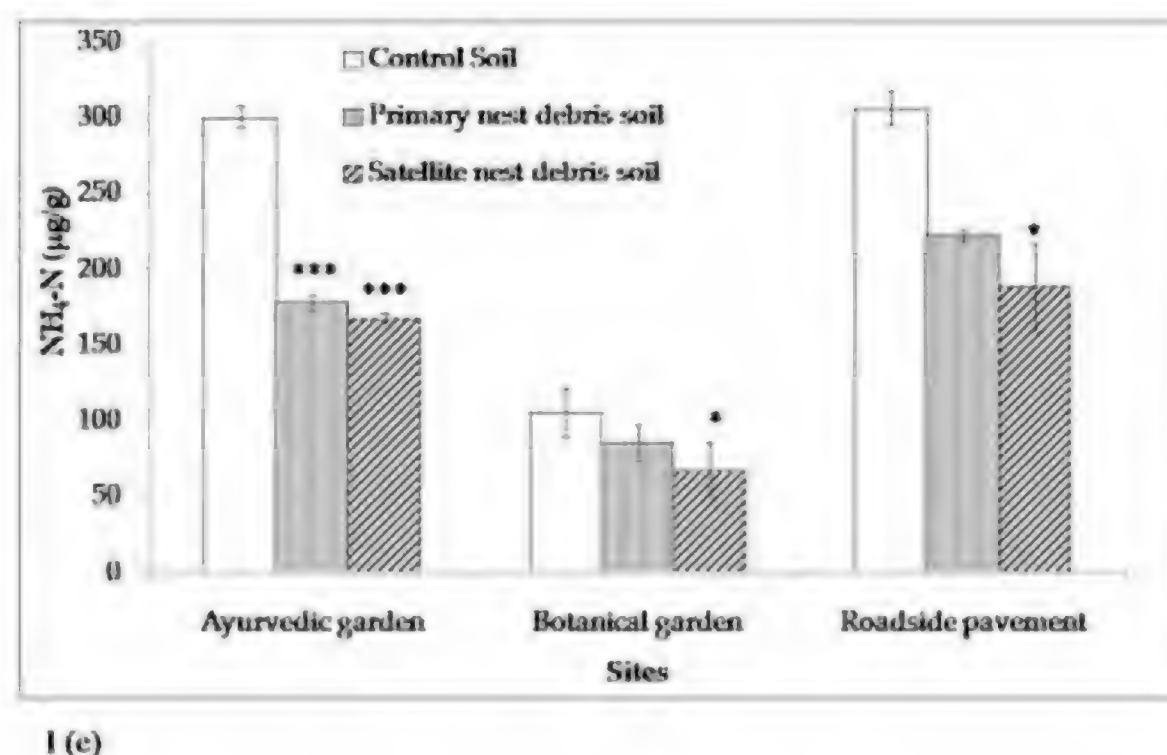


Figure 1. Debris soil nutrient content (Mean \pm SEM): (a) Total carbon (b) Total nitrogen (c) Total phosphorus (d) Nitrate-nitrogen (NO₃-N) and (e) Ammonium- nitrogen (NH₄-N) concentration in the nest (primary and satellite nests) debris and control soil sampled at the 3 sites, Ayurvedic garden, the Botanical garden and the unpaved roadside areas, located in Banaras Hindu University campus, in Varanasi, India. (One-way ANOVA followed by Dunnett's *post hoc* test: * $p < 0.05$, ** $p < 0.01$ and *** $p < 0.001$).

Discussion

The results reveal that nest excavation and maintenance activities of the sugar-loving ant, *C. compressus* have a significant impact on the physico-chemical characteristics of the debris soil (Fig. 1a-e). While the debris soil exhibited higher moisture, total N, P and NO₃-N content, the concentrations of total C and NH₄-N were lower as compared to the respective control soil. It demonstrated a greater proportion of particles in the large size (1.00 to 2.00 mm) category as compared to the control soil. Thus the debris soil texture was different as compared to the control. The changes in debris soil particle size distribution may increase aeration and influence water infiltration properties.

Most mineral nutrients are readily available to plants when soil pH is near neutral. The primary and satellite nest debris soil exhibited a neutral pH which makes the debris soil more suitable for growing crop plants. The shift in *C. compressus* debris soil pH toward neutrality is consistent with earlier reports of ant nest soil (Frouz *et al.*, 2003; Wagner *et al.*, 2004; Frouz and Jílková, 2008). It is suggested to be due to the increase of basic cations such as Ca²⁺, Mg²⁺, K⁺, and Na⁺ (Brady and Weil, 1999;

Jílková *et al.*, 2011, 2012) contributed by mineral compounds released from the decomposition of the organic matter carried to the ant nests. Our results support earlier studies on the nest chamber soil of a sugar-loving ant species, *Lasius flavus*, which was found to have low C (Dostál *et al.*, 2005), high N and high P (Dostál *et al.*, 2005; Hudson *et al.*, 2009). Carbon-nitrogen ratio in the soil is extremely important, since carbon is important as energy - producing factor while nitrogen builds up the plant tissue. It is established that a low C-N ratio is responsible for the decrease in nitrogen immobilization during the soil organic matter decomposition by microorganisms which thereby increases the crop yield (Swift *et al.*, 1979). Our studies demonstrate a lower C-N ratio in *C. compressus* debris soil. Phosphorus is the non-mobile nutrient for plant. Root interception and diffusion is largely responsible for phosphorus uptake (Eash *et al.*, 2015). *Camponotus compressus* debris soil exhibited a higher proportion of P as compared to the control soil. Our results thus support earlier studies of enhanced P in nest soil of many species such as the temperate grassland ants of Europe, *Lasius* spp. (Wagner *et al.*, 2004; Frouz

et al., 2003; Dostál *et al.*, 2005) and in the debris soil of *Pheidole latinoda*, (Shukla *et al.*, 2013) a species commonly found in a wide variety of anthropogenically disturbed ecosystems in India (Agarwal *et al.*, 2007).

While total N and NO₃-N content of debris soil was higher that of NH₄-N was lower than that found in the control soil. Atmospheric nitrogen is converted into NO₃⁻ and NH₄⁺ forms in the soil by nitrogen fixation, which is performed by certain soil micro-organisms. Plants can absorb nitrogen either as Nitrate (NO₃⁻) or as Ammonium (NH₄⁺), and therefore, the total uptake of nitrogen usually consists of a combination of these two forms (Hodges, 2010). Ammonium and nitrate nitrogen are the predominant inorganic forms of nitrogen in soils. Both low pH and limited ammonium availability are suggested to reduce nitrification (Robertson, 1982).

Since new satellite nests are constructed with high frequency these nest constructions would lead to greater soil aeration and may even influence the rate of flow of water through the soil. Hummocks made by *Formica podzolica* in peatland soils are found not only to contribute to better aeration than the surrounding peat but also served as a habitat for diverse plant species (Lesica and Kanno, 1998).

Our study indicates a significant contribution of *C. compressus* nest debris soil in enhancing soil nutrients particularly P and N, which could contribute to better growth of both the road side as well as garden plants. The nest density of satellite nests was about 2 times more than the primary nests, at each of the 3 sites but the debris accumulated by each primary nest was 3 to 5 times more than a satellite nest. So, the resultant output in the form of amount of the debris/100 m² was found to be about 2 times greater in a primary nest than a satellite nest.

The nest density of the primary and satellite nests of *C. compressus*, in each of the 3 sites per month/hectare was found to be respectively 55.83 ± 6.06 and 112.5 ± 12.22 from the AG site, 67.5 ± 3.46 and 159.17 ± 22.28 from the BG site, 178.33 ± 1.67 and 357.5 ± 45.97 from the RS site. As a result, even under anthropogenically disturbed conditions of managed ecosystems, about 3.1361 kg of C, 1.5482 kg of N, 0.05853 kg of P, 0.14457 kg of

NO₃-N, 0.1744 kg of NH₄-N per hectare are annually added via the debris soil of the primary nests of *C. compressus*. Moreover, 1.7868 kg of C, 0.7955 kg of N, 0.0318 kg of P, 0.0559 kg NO₃-N, 0.09623 kg of NH₄-N per hectare are annually added via the debris soil of the satellite nests. Thus, nest construction and maintenance activities of *C. compressus* colonies not only influence the soil nutrients, particularly by enhancing P and N, but also affect the physical characteristics. The high turnover of the satellite nests may also affect the soil hydrological properties. Since *C. compressus* is a common and abundant ant species of annual cropping systems (Agarwal and Rastogi, 2008) this nutrient enhancement would contribute towards enhanced agroecosystem productivity.

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On *Cryptarcha* Shuckard of North-east India (Coleoptera: Nitidulidae: Cryptarchinae) with description of a new species

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Abstract

Three species of *Cryptarcha* Shuckard (*Cryptarcha dubia* Grouvelle, 1890, *Cryptarcha maculata* Reitter, 1873 and *Cryptarcha raychaudhuri* sp. n.) have been worked out of a collection from North-east India. The genus and the species are (re)described. A key to the species of *Cryptarcha* from India is appended.

Keywords: *Coleoptera*, *Nitidulidae*, *Cryptarcha*, *Northeast India*, *new species*.

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Introduction

Sap beetles, though often seen in nature, have not been well studied in India for the past few decades. A small collection of the genus *Cryptarcha* Shuckard, 1839 from India, especially from the states of North-east India formed the basis of this study.

Cryptarcha is a moderately large genus distributed to all major biogeographic regions of the world with prevalence in the Neotropics. Shuckard (1839) erected the genus *Cryptarcha* under the family Nitidulidae for two species, *Nitidula strigata* (Fabricius, 1787) and *Nitidula imperialis* (Fabricius, 1792) on the basis of origin of antennae beneath lateral projections of the head. Grouvelle (1908) while dealing with the nitidulid fauna of the Indian subcontinent, re-characterised the genus *Cryptarcha*, added two species and provided a key to the species of *Cryptarcha* from India. Grouvelle (1913) in the “*Coleopterorum Catalogus*” listed 115 species under *Cryptarcha* from the world. Parsons (1938) while dealing with North American *Cryptarcha*, recognised two subgenera under *Cryptarcha*, viz., *Cryptarcha* Shuckard and *Lepiarcha* Sharp. Jelínek (1974) erected the genus *Calosphaera* on the basis of *Cryptarcha ocularis* Reitter, 1875 and shifted several species of *Cryptarcha* to this genus. He (op. cit.)

recognised two subgenera under *Cryptarcha* (*Arhina* Murray, 1867 and *Lepiarcha* Sharp, 1891). Kirejtshuk (1981) divided the genus into five species groups, viz., ‘*strigata*’ group, ‘*sjoestedti*’ group, ‘*senegalensis*’ group, ‘*quadripunctata*’ group and ‘*incertae sedis*’ group, and gave generic status to *Arhina* Murray, 1867 which was previously recognised as a subgenus under *Cryptarcha*. Kirejtshuk (1987) dealt with the *Cryptarcha* of Indo-Malayan zone of the Oriental region and synonymised several species. Kirejtshuk (1999) while dealing with Indian nitidulidae, recorded *C. inhalita* for the first time from the Himalaya. Jelínek & Audisio (2007) in the ‘*Catalogue of Palearctic Coleoptera*’ listed five synonyms of the genus *Cryptarcha*, viz., *Africanips* Lechanteur, 1959, *Cryptarchina* Iablokoff-Khnzorian, 1966, *Cryptarchula* Ganglbauer, 1899, *Cryptarchus* Heer, 1841, and *Lepiarcha* Sharp, 1891. Kirejtshuk (2008) synonymised *Cryptarchus* Heer, 1843 and *Priatelus* Broun, 1882 with *Cryptarcha* and listed five other synonyms of *Cryptarcha* (*Lepiarcha* Sharp, 1891; *Liarcha* Sharp, 1891; *Cryptarchula* Ganglbauer, 1899; *Africanips* Lechanteur, 1959; *Cryptarchina* Iablokoff-Khnzoryan, 1966). Hisamatsu (2010) gave comparative

characteristic features of *Cryptarcha kapfereri* Reitter and *C. inhalita* Reitter.

By now, three species, viz., *Cryptarcha wallacei andrewesi* Grouvelle, 1908, *Cryptarcha dubia* Grouvelle, 1890 and *Cryptarcha maculata* Reitter, 1873 (= *Cryptarcha lesnei* Grouvelle, 1903, *Cryptarcha fraterna* Grouvelle, 1908) were recorded from India; *Cryptarcha inhalita* Reitter, 1885 has been considered as an Indian species in view of its record from Himalaya (see Kirejtshuk, 1999). Of these, only three species (*C. dubia*, *C. wallacei andrewesi* and *C. maculata*) were hitherto recorded from North-east India (Sikkim).

Materials and Methods

Materials of *Cryptarcha* Shuckard from five states of India [Sikkim, West Bengal, Assam, Pondicherry (Mahé) and Arunachal Pradesh] and some foreign countries (Thailand and Indonesia) were available to the authors for study. Some earlier collections from Sikkim and Arunachal Pradesh and collections obtained from the National Collection of ZSI formed the basis of this study. The specimens examined in this study are housed in the Zoological Survey of India, Kolkata (ZSIC).

Specimens of *Cryptarcha* were preserved in 70% ethyl alcohol. These were subsequently mounted on rectangular hard paper board and pinned with proper locality and habitat data. For detailed morphological study, slides were prepared of the dissected parts. Mounted dry specimen of *Cryptarcha raychaudhurii* sp. n. was relaxed first by laying in water for about an hour. The relaxed specimen was placed on glass slide with a drop of water and the hind wings and elytra were dissected out under a dissecting microscope. The wingless body was then placed in 10% KOH solution, after minor incision between pro- and mesothorax and metathorax and abdomen, for about 24 hours. The specimen was then washed in distilled water and mild acetic acid solution for 10 minutes respectively. The washed specimen was passed on to absolute alcohol through 30%, 50%, 70%, 90% grades of alcohol for 10 minutes in each grade. The detached elytra and wings were similarly dehydrated as above. All the parts were kept in absolute

alcohol for about 10-15 minutes for complete dehydration and then transferred to clove oil. The body parts of the specimen were then placed on a clear glass slide with a drop of clove oil and finally dissected under a WILD M5A stereoscopic binocular microscope. The dissected parts were mounted in Canada balsam by cover slips. For studying male genitalia of the other specimens, their abdomens were separated from the body. The wet/water soaked abdomens were placed in 10% KOH solution for about 24 hours and then passed on to clove oil in above manner. Each of the male genitalia was dissected out with two fine dissecting needles under the stereomicroscope and placed in a drop of Canada balsam on a piece of cover glass. The cover glass was glued on a piece of ivory paper and pinned with the respective specimen with required data for types and other specimens. External features and other structures were studied using Leica ® M205A stereoscopic microscope with magnification 7.81× to 160.1× and images were recorded, when necessary. Illustrations were made with the aid of Camera lucida; detailed features of various body parts were sketched by using the digitised images, and examination under an OLYMPUS compound microscope. The species were identified by comparison with the reference material in the collection of ZSI and the original descriptions of the species and a key by Grouvelle (1908).

Results

Altogether 3 species were recognised under *Cryptarcha* amongst the examined material (*Cryptarcha dubia* Grouvelle, 1890, *Cryptarcha maculata* Reitter, 1873 and *Cryptarcha raychaudhurii* sp. n.). Material of two Indian species viz., *C. wallacei andrewesi* Grouvelle, 1908 and *C. inhalita* Reitter, 1884 were not available for examination. The worked out species and the genus are (re)described and a key to the species of *Cryptarcha* Shuckard, 1839 of India is provided.

SYSTEMATIC ACCOUNT

Family NITIDULIDAE Latreille, 1802

Subfamily CRYPTARCHINAE Thomson, 1859

Tribe CRYPTARCHINI Reitter, 1884

Genus *Cryptarcha* Shuckard, 1839

Cryptarcha Shuckard, 1839: 165 (Type species: *Nitidula strigata* Fabricius, 1787); Heer, 1841: 393, 409; Erichson, 1843: 355; Erichson, 1845: 221; Redtenbacher, 1845: 74; Redtenbacher, 1849: 19, 172; Bach, 1851: 220; Lacordaire, 1854: 326; Redtenbacher, 1858: LXXVIII, 338; Jacquelin du Val, 1858: 153, 159; Gutfleisch & Bose, 1859: 234, 247; Thomson, 1859: 69; J. Leconte, 1861: 84; Thomson, 1862: 182; Thomson, 1867: 382; Reitter, 1873: 140, 141; Redtenbacher, 1874: LXXXV, 369; Reitter, 1875: 30; Horn, 1879: 321; Everts, 1881: 13, 55; Leconte & Horn, 1883: 151; Reitter, 1884: 269; Marseul, 1885: 20, 125; Fowler, 1885: 72, 73; Fowler, 1889: 259, 260; Sharp, 1891: 374; Everts, 1898: 470, 492; Ganglbauer, 1899: 549; Stierlin, 1900: 521, 538; Lameere, 1900: 354; Grouvelle, 1908: 395; Blatchley, 1910: 648; Reitter, 1911: 37; Grouvelle, 1913: 177; Jelínek, 1974: 190; Kirejtshuk, 1981: 766.

Priateles Broun, 1881: 668 (Type species *Priateles optandus* Broun, 1881). Synonymised by Kirejtshuk, 2008.

Priates: Broun, 1882: 409. Changed spelling of generic name for *Priateles*.

Priatelus: Kirejtshuk, 2008: 112, 121. Changed generic name of *Priates* and *Priateles*.

Lepiarcha Sharp, 1891: 385 (Type species *Cryptarcha omositoides* Reitter, 1873). Synonymised by Kirejtshuk, 1981.

Liarcha Sharp, 1891: 385 (Type species *Liarcha placida* Sharp, 1891). Synonymised by Kirejtshuk, 2008.

Cryptarchula Ganglbauer, 1899: 550 (Type species: *Nitidula undata*

Olivier, 1790). Synonymised by Jelínek, 1974.

Africanips Lechanteur, 1959: 107 (Type species: *Africanips niger* Lechanteur, 1959).

Synonymised by Kirejtshuk, 1997.

Cryptarchina Iablokoff-Khnzoryan, 1966: 313 (Type species: *Cryptarchina incognita* Iablokoff-Khnzorian, 1966, by monotypy). Synonymised by Kirejtshuk, 1981.

Description

General appearance (Figs. 1-14): Oblong-ovate, moderately convex dorsally and subdepressed ventrally, rather shiny, dorsal cuticle punctate-pubescent or glabrous, colour testaceous to dark brown, labrum fused with clypeus, antenna with loosely arranged three-segmented club, pronotum and elytra somewhat explanate laterally; abdominal segments almost entirely covered by elytra dorsally, pygidium sometimes visible; adult male possesses an additional abdominal sclerite posteriorly.

Head (Fig. 1) rather large, transverse, narrower than prothorax and partly inserted within it, frons dilated over antennal insertions, mandibles almost concealed beneath the projection of frons, no fronto-clypeal suture; eyes moderately large and deeply set within the head, coarsely faceted, tempora indistinct; no marked neck constriction. Tentorium with two long tentorial arms with a short lateral process from tentorial arms near posterior third, transverse corpotentorium looped anteriorly. Antenna longer than head; antennal insertions concealed under projections of frons, scape subglobular to slightly elongate and concealed beneath dorsum, segments 2–3 narrower than scape and distinctly elongate; segments 4 to 7 short, subequal, about as broad as long or slightly elongate; segment 8 more transverse and broader than preceding segments; club 3-segmented, longer than broad, segments loosely arranged. Ventrally, antennal grooves narrow and somewhat subparallel. Mandible (Fig. 8) slightly longer than broad, tip of mandibles long and sharply pointed, mola well-developed, setosed prostheca extended like a process, no distinct mandibular cavity. Maxilla

(Fig. 9) devoid of galea; lacinia elongate, apex somewhat pointed, apex and inner margin densely hairy; palpi with palpomere 1 short; palpomere 2 longer than palpomere 1, as broad as and slightly longer than palpomere 3; palpomere 4 (apical segment) longer than preceding segments and fusiform. Labium (Fig. 10) with mentum distinctly transverse, pubescent, apical margin bi-sinuate; ligula transverse with lobes projecting and horn-like; palpi with palpomere 1 short, palpomere 2 elongate, palpomere 3 longest with rounded apex. Labrum fused with clypeus; only a faint outline of labrum visible dorsally.

Prothorax (Fig. 2): transverse, about as broad as elytra; apical margin broadly emarginate; anterior angle projecting, posterior angles sub-acute; lateral margins arcuate; pronotal disc rather convex; prosternal process slightly narrower between coxae, feebly broader near apex; front coxae contiguous internally; coxal cavities distinctly transverse, externally and internally closed, trochantins exposed; notosternal sutures subparallel and extending to border of foramen.

Meso-metathorax (Fig. 3): Mesoventral process about as wide as prosternal process. Mesocoxae slightly more widely separated than front coxae, coxal cavities open outwardly, mesosternal fitting between mesocoxae almost in a straight line. Metaventrite somewhat transverse, discrimen extending to about two-thirds of length of metaventrite from base, metacoxae about as widely separated as mesocoxae; mesocoxae bordered by coxal lines reaching at almost one-third of the distance along metaventral-metanepisternal suture, forming distinct axillary space.

Metendosternite (Fig. 11): well-developed, with a broad basal stalk bifurcated into two lateral arms, anterior tendons rather closely situated.

Elytra and hind wings: Elytra (Fig. 4) slightly elongate, apices conjointly or separately rounded, punctation dot-like and indistinct; setae whitish, fine, short and semi-erect; epipleura moderately developed and extending almost to apex. Wing (Fig. 6) simple and venation reduced, with moderately long radial vein, cubitus vein branched, two anal veins; without subcubital fleck or radial cell.

Legs (Fig. 7): moderately long, trochanters short and simple, femora broadened; slender tibiae slightly broadened at apex with two distinct apical spurs; tarsal formula 5-5-5 in both sexes, tarsal segments bilobed and setosed apically, tarsomeres 1 to 3 dilated apically, tarsomere 4 shortest, claws simple.

Abdomen (Fig. 5): broader than long; pygidium seldom marginally exposed, usually concealed beneath elytra; intercoxal process of ventrite 1 moderately broad and its apex rounded; ventrites 2-4 short and subequal, ventrite 5 longer than preceding three ventrites. Ventrites setose. An anal sclerite (tergite VIII) present in males.

Genitalia: Aedeagus (Figs. 13-18) with elongated median lobe, dorsoventrally flattened; a single median strut running along ventral face; tegmen forming a receptacle, with a small median depression at apex, setae arises from the middle of the apex, lateral edges subparallel, tegminal struts join basally to form a ring around median lobe. Anal sclerite and spiculum gastrale (as in Fig. 12). Ovipositor not studied.

Sexual Dimorphism: Males possess an additional abdominal sclerite posteriorly.

Habitat: Most species inhabit subcorticolous habitat; presumably feed on fungi and decomposed plant sap.

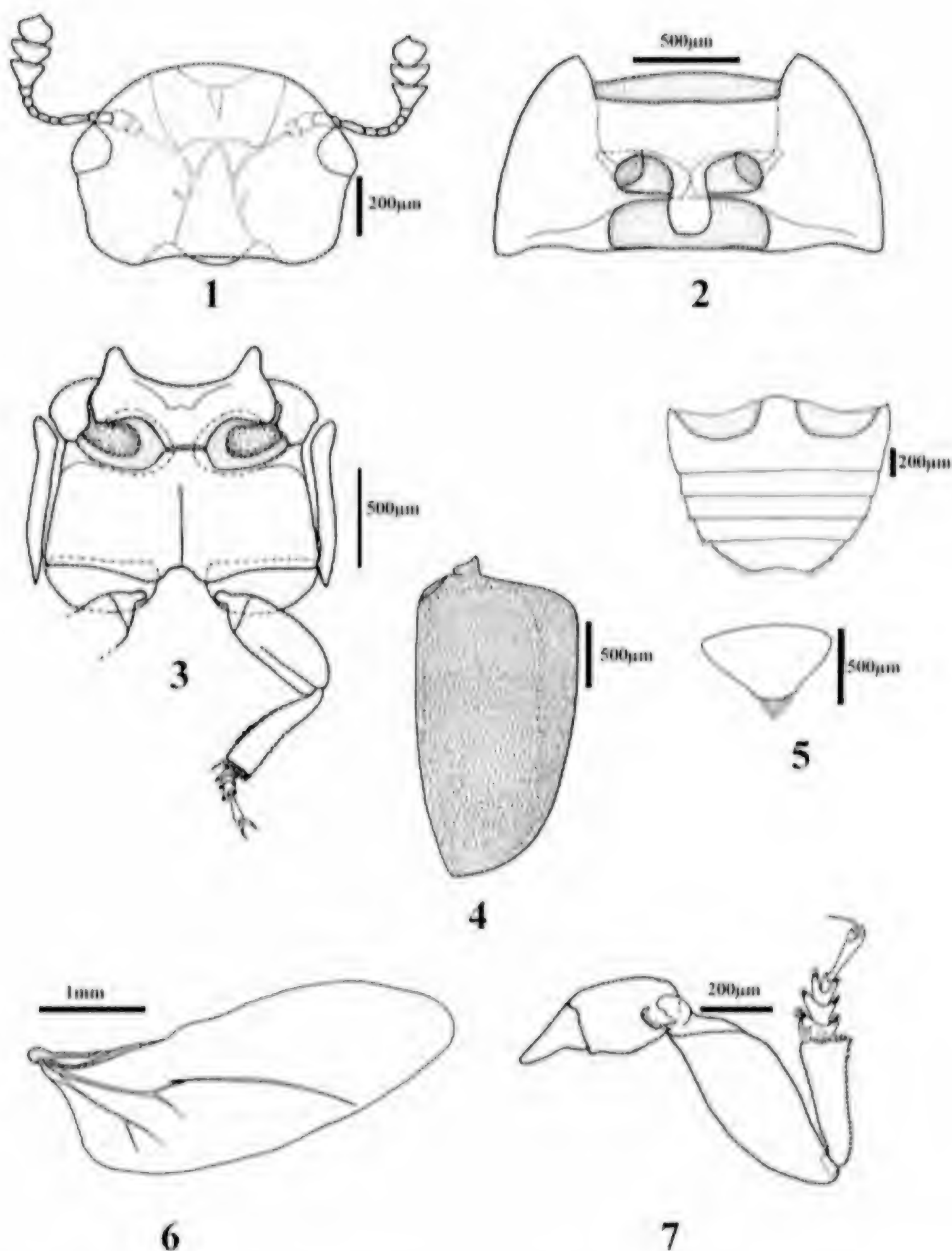
Distribution: Distributed in all the major biogeographic regions of the world.

Remarks: *Cryptarcha* is closely related to other genera of Cryptarchinae such as *Eucallosphaera* Jelínek, 1978 and *Glischrochilus* Reitter, 1873 but can be differentiated from both these genera by its distinct pubescence on dorsum, frons dilated over antennal insertions and sub-parallel antennal grooves (vs. dorsum glabrous, frons not dilated over antennal insertions and antennal grooves either converging or diverging in *Eucallosphaera* and *Glischrochilus*). *Cryptarcha* also shares certain resemblances with *Platyarcha* Kirejtshuk, 1987 but can be differentiated by its weakly convex body; well-developed, three-segmented, compact antennal club; anterior corners of mentum more or less rounded and not projecting anterad; relatively

less widened prosternal process before rounded or medially notched apex; apex of elytra conjointly or separately rounded (vs. dorsoventrally flattened body; relatively small, two-segmented antennal club with preceding

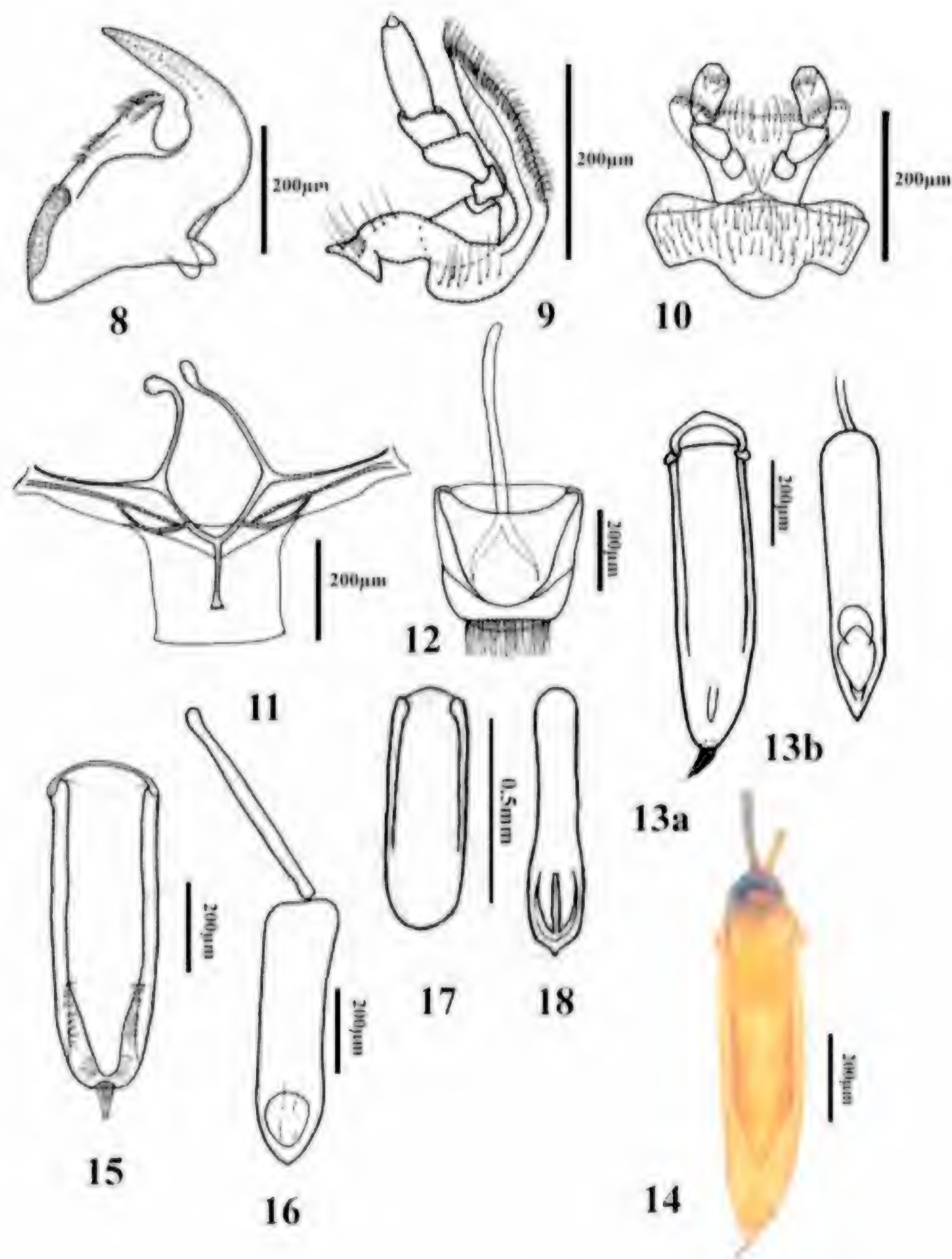
segment somewhat widened anterad; anterior corners of mentum sharply acuminate and projecting anterad; prosternal process distinctly widened before truncate apex; apex of elytra truncate in *Platyarcha*).

PLATE- I



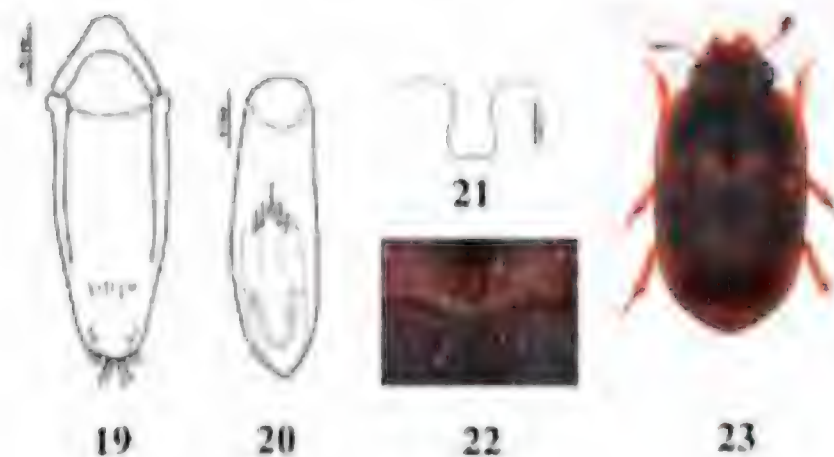
Figures 1-7. *Cryptarcha raychaudhurii* sp. n., line drawings: 1, head, dorsal view; 2, prothorax, ventral view; 3, meso-metathorax, ventral view; 4, right elytron, dorsal view; 5, abdomen, ventral view and pygidium, dorsal view; 6, wing; 7, front leg.

PLATE- II



Figures 8–12. 15–16. *Cryptarcha raychaudhurii* sp. n., line drawings: 8, mandible, dorsal view; 9, maxilla, ventral view; 10, labium, ventral view; 11, metendosternite; 12, spiculum gastrale and anal sclerite, ventral view; 15, male genitalia: tegmen, ventral view; 16, male genitalia: median lobe, ventral view; **13–14.** *Cryptarcha maculata* Reitter, 1873: 13, male genitalia, ventral view (line drawing): 13a, Tegmen; 13b, Median lobe; 14, male genitalia, ventral view (photo); **17–18.** *Cryptarcha dubia* Grouvelle, 1890: 17, male genitalia: tegmen, ventral view (adapted from Kirejtshuk, 1987); 18, male genitalia: median lobe, ventral view (adapted from Kirejtshuk, 1987).

PLATE-III



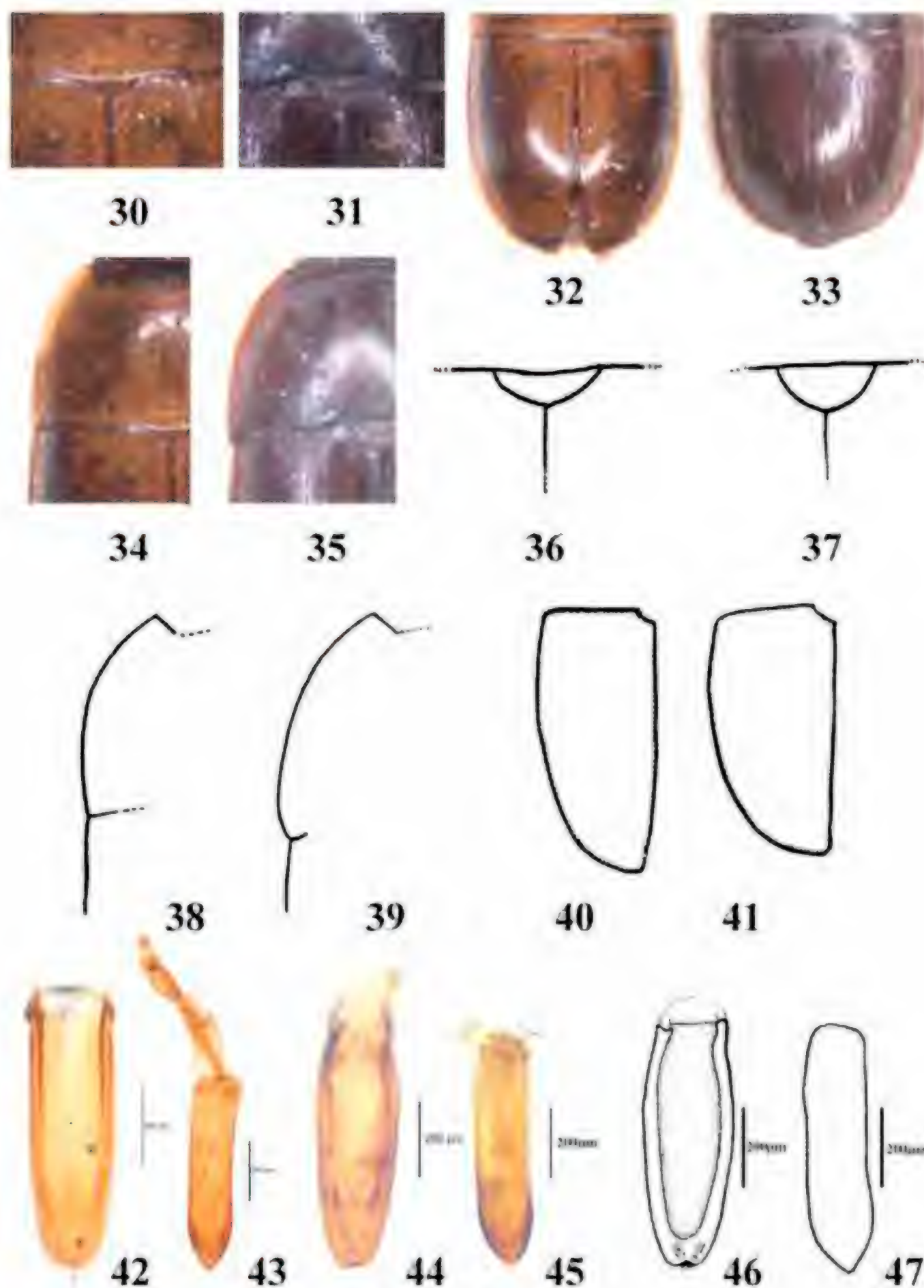
Figures 19-23. *Cryptarcha inhalita* Reitter, 1884: 19, tegmen, ventral view (line drawing adapted from Hisamatsu, 2010); 20, median lobe (line drawing adapted from Hisamatsu, 2010); 21, prosternal process (line drawing adapted from Hisamatsu, 2010); 22, scutellum (photo derived from Hisamatsu, 2010); 23, dorsal view (photo derived from Hisamatsu, 2010).

PLATE-IV



Figures 24-25. *Cryptarcha raychaudhunii* sp. n., photographs: 24, dorsal view, 25, ventral view; **26-27.** *Cryptarcha dubia* Grouvelle, 1890: 26, dorsal view, 27, ventral view; **28-29.** *Cryptarcha maculata* Reitter, 1873: 28, dorsal view, 29, ventral view.

PLATE-V



Figures 30-31. Scutellar shield (photo): 30, *C. raychaudhurii*; 31, *C. dubia*; **32-33.** Elytra (photo): 32, *C. raychaudhurii*; 33, *C. dubia*; **34-35.** Pronotum and elytral junction (photo): 34, *C. raychaudhurii*; 35, *C. dubia*; **36-37.** Scutellar shield (line drawing): 36, *C. raychaudhurii*; 37, *C. dubia*; **38-39.** Pronotum and elytral junction (line drawing): 38, *C. raychaudhurii*; 39, *C. dubia*; **40-41.** Left elytron (line drawing): 40, *C. raychaudhurii*; 41, *C. dubia*; **42-43.** *C. raychaudhurii*: Male genitalia (photo): 42, Tegmen, ventral view; 43, Median lobe, ventral view; **44-47.** *C. dubia*: Male genitalia: 44, Tegmen, ventral view (microphotograph); 45, Median lobe, ventral view (microphotograph); 46, Tegmen, ventral view (line drawing); 47, Median lobe, ventral view (line drawing).

PLATE-VI



Figures 48-49. Fifth abdominal ventrite (photo): 48, *C. raychaudhurii*; 49, *C. dubia*.

Key to the species of *Cryptarcha* Shuckard of India

1. Prothorax slightly more than 2x as wide as long; elytra unicolorous, entirely black.....*C. wallacei andrewesi*
Grouvelle, 1908
- Prothorax less than 2x as wide as long; elytra often bicoloured and not entirely black, if unicolorous then reddish brown or yellowish brown.....2
2. Elytral pubescence intermixed with longer setae, longer setae arranged in longitudinal rows; elytra with dark or pale patches, prosternal apex slightly emarginate or notched in the middle.....3
- Elytral pubescence uniform, composed of short setae, setae irregular and not arranged in rows; elytra unicolourous yellowish or reddish brown; prosternal apex broadly rounded or truncate, but not notched in the middle.....4
3. Scutellar shield distinct, rather transverse. Tegminal apex of male genitalia (Figs. 13a, 14) with a tuft of setae at middle; median lobe (Fig. 13b) with subparallel sides, distinctly narrowed in apical one-fourth with acuminate tip.....*C. maculata*
Reitter, 1873
- Scutellar shield indistinct, scarcely visible from above (Fig. 22). Tegminal apex of male genitalia with scattered setae (Fig. 19), median lobe (Fig. 20) somewhat widened and slowly narrowed in apical one-fourth towards apex.....*C. inhalita*
Reitter, 1884

4. Scutellar shield (Figs. 31, 37) about 2x as broad as long; elytra slightly broader than long (Figs. 33, 41), anterior margin of elytra slightly narrower than base of prothorax thereby making a distinct obtuse angle at their junction (Figs. 35, 39); posterior edge of fifth abdominal ventrite and anal sclerite in male sparsely setose (Fig. 49), devoid of tuft of longer setae in the middle; body colour dark brown. Tegmen (Figs. 44, 46) in male genitalia somewhat inflated medially with a rounded apex with tiny sparse setae at the middle.....*C. dubia*

Grouvelle, 1890

- Scutellar shield (Figs. 30, 36) at least 3x as broad as long; elytra slightly longer than broad (Figs. 32, 40), anterior margin of elytra as wide as base of prothorax thereby not making a demonstrable angle at their junction and the junction appears like a slight sinuation of outer margin (Figs. 34, 38); posterior edge of fifth abdominal ventrite and anal sclerite (Fig. 50) in male densely setose, with a bunch of longer setae at mid-ventral region; body colour reddish-brown. Tegmen (Figs. 15, 42) in male genitalia with subparallel sides, slightly narrowed in apical third, spatula-shaped; tip of the apex somewhat truncate with a small tuft of setae.....*C. raychaudhurii* sp. n.

1. *Cryptarcha dubia* Grouvelle, 1890

Cryptarcha dubia Grouvelle, 1890: 126.

Diagnosis: Body (Figs. 26, 27) broadly oval, rather convex, dull, colour uniformly reddish-brown, dorsum finely punctate with white and closely appressed setae; posterior corners of pronotum somewhat extending posterad, thereby making an angle with the base of elytra; elytra conjointly slightly broader than long; apical margin of fifth abdominal ventrite and anal sclerite devoid of dense setae.

Head: transverse, about 1.3x as broad as long, frons feebly depressed; punctures on vertex indistinct polygonal, about 3x as large as eye facets; punctation on frons indistinct polygonal, diameter slightly larger than those of vertex, separated by about 0.25–0.5 diameter of punctures; eyes small and non-projecting, about 0.3x as long as head, outer margin rounded,

coarsely faceted; temple indistinct; few setae present near the sides of frons, setae on vertex indistinct. Antenna about 1.1x as long as head; antennal club about 0.3x as long as antenna, about 1.7x as long as broad, club segments loosely attached.

Prothorax: transverse (1.0:1.9), anterior margin broadly emarginate; sides arcuate, posterior margin bisinuate, anterior and posterior angles somewhat projecting (Figs. 35, 39). Surface of pronotum distinctly punctate, punctures small, round, about as large as eye facets, separated on top of pronotal disc by 1–2 diameter; very fine, closely appressed setae on disc.

Scutellar shield (Figs. 31, 37): transverse, about 2x as broad as long, triangular with rounded apex; punctures and setae not visible.

Elytra: slightly broad (Figs. 33, 41), anterior margin of elytra closely fit with posterior margin of prothorax and slightly narrower than base of prothorax, humeral angles slightly obtusely rounded, sides arcuate, borders slightly explanate, apices conjointly rounded; punctures slightly larger than those on pronotum, separated by 0.5–1 diameter; setae golden, moderately thick and long, closely appressed to the surface and posteriorly directed.

Abdominal tergites partially covered by the elytra, setae golden, moderately long, densely and uniformly arranged, decumbent and posteriorly directed. Pygidium devoid of tuft of long setae.

Ventral side: dark brown with median part of prothorax and meso-metathorax blackish. Prosternal process with slightly truncate apex. Metaventricle densely setose. Posterior edge of fifth abdominal ventrite and anal sclerite in male sparsely setose (Fig. 49), devoid of any tuft of longer setae.

Aedeagus (Figs. 44–47): Tegmen (Figs. 44, 46) somewhat inflated medially with a rounded apex and tiny sparse setae at the middle. Median lobe (Figs. 45, 47) elongate, subparallel, apex acuminate.

Measurements (in mm.): Total length 3.03, width of head across eyes 0.74, length of antenna 0.70, length and width of prothorax 0.98 and 1.92, length and width of elytra together 1.74 and 1.88.

Material examined: THAILAND: Meetaw forest, West Raheng, 1500 ft. altitude, 1 ex., 03.iv.1913, C. S. Barton, ex. caught in bamboo in damp heavy jungle on slope of hill facing east (Reg. No. 3586/21).

Distribution: INDIA: Sikkim, West Bengal (Darjeeling); MYANMAR: Bhamò; LAOS; VIETNAM; THAILAND (New Record); INDONESIA.

Remarks: It has been noted that the features of tegmen and median lobe of this species show considerable variation with those of *C. dubia* presented by Kirejtshuk (1987) [See Figs. 17, 18] viz., elongated tegmen, subparallel sides with a rounded apex, U-shaped, devoid of apical tuft of setae; narrow and elongate median lobe, slightly broader in apical one-third, apex rounded with a small conical protrusion from its middle. These make a point of interest to us. We have, however, neither examined any male genitalia nor seen any photograph of the above form.

2. *Cryptarcha maculata* Reitter, 1873

Cryptarcha maculata Reitter, 1873: 151.

Cryptarcha ritsemai Olliff, 1884: 246.

(Synonymised by Kirejtshuk, 1987)

Cryptarcha lesnei Grouvelle, 1903: 118.

(Synonymised by Kirejtshuk, 1987)

Cryptarcha fraterna Grouvelle, 1908: 395.

(Synonymised by Kirejtshuk, 1987)

Cryptarcha bonyfacyi Grouvelle, 1912: 502.

(Synonymised by Kirejtshuk, 1987)

Cryptarcha longipennis Hisamatsu, 1961: 31.

(Synonymised by Kirejtshuk, 1987)

Diagnosis: Body (Figs. 28, 29) oblong-ovate, rather convex, somewhat shiny, colour dark brown with reddish patches over elytra: on apical margin at the middle of each elytron and along elytral suture; mandibles exposed; dorsum finely punctate with sparse, moderately long and thick, golden, decumbent setae.

Head: transverse, about 1.3x as broad as long, frons feebly depressed; punctures on vertex round, about as large as those of eye facets; punctation on frons round, distinct, diameter about as large as those of vertex, separated by

about 1-2 diameter of punctures; eyes small and non-projecting, about 0.4x as long as head, outer margin rounded, coarsely faceted; temple indistinct; golden, rather thick, semi-erect setae on frons. Antenna about 1.2x as long as head; antennal club about 0.3x as long as antenna, about 1.6x as long as broad, club segments loosely attached.

Prothorax: transverse (1.0:1.8), anterior margin broadly emarginated, slightly bisinuate; sides arcuate, posterior margin distinctly bisinuate, anterior and posterior angles distinctly projecting. Pronotum convex, surface distinctly punctate, punctures round, dense, about as large as eye facets, separated on top of pronotal disc by 2-3 diameters; moderately thick, decumbent setae on disc.

Scutellar shield: rather short, transverse, about 2.8x as broad as long, triangular and somewhat rounded apically; punctures and setae indistinct.

Elytra: about as long as broad, anterior margin closely fit with posterior margin of prothorax, humeral angles nearly right-angled, sides arcuate, borders narrowly explanate, apices separately rounded; punctures slightly larger than those on pronotum, separated by 0.5-1 diameter; two rows of longitudinal setae: 1) fine, short, appressed, posteriorly directed and 2) moderately thick and long, semi-erect, forming striae.

Abdominal tergites fully covered by elytra.

Ventral side: uniformly chestnut-brown. Prosternal process with apex notched in the middle. Metaventricle punctate-pubescent.

Aedeagus (Figs. 13, 14): Tegmen (Figs. 13a, 14) narrow, sides subparallel and gently tapering in the apical third of its length with a dense tuft of setae at middle of apex. Median lobe (Fig. 13b) with subparallel sides, distinctly narrowed in apical one-fourth with acuminate tip.

Measurements (in mm.): Total length 2.73-2.83, width of head across eyes 0.71-0.75, length of antenna 0.60-0.76, length and width of prothorax 0.89-0.96 and 1.57-1.77, length and width of elytra together 1.53-1.61 and 1.57-1.75.

Material examined: INDIA: Calcutta, 1 ex., (Reg. No. 3771/18); Assam, Damchera, 09.viii.1957, 2 ex., ZSI Lot No. 51. 1957, Det. by T. G. Vazirani, 1957 (Reg. No. 12089/H4 and

12091/H4); Assam, Damchera, 2 ex., 09.viii.1959, *Cryptarcha fraterna* Grouvelle: Det. by T. G. Vazirani, 1957 [ZSI Reg. No. 12089/H4 & 12091/H4]; INDONESIA: N. O. Sumatra, Tandjong Morawa, Serdang, 1 ex., Dr. B. Hagen, Det. as *Cryptarcha ritsemai* Olliff [ZSI Reg. No. 1351/13].

Distribution: INDIA: Assam (New Record), West Bengal, Sikkim, Pondicherry (Mahé), Kerala, Tamil Nadu; NEPAL; CHINA; HONGKONG; MACAO; JAPAN; TAIWAN; KOREA; INDONESIA.

3. *Cryptarcha raychaudhuri* Dasgupta & Pal sp. n.

[urn:lsid:zoobank.org:act:55E7C14C-40A5-4DB7-8625-98BF59900F92](https://zoobank.org/act:55E7C14C-40A5-4DB7-8625-98BF59900F92)

Diagnosis: Body (Figs. 24, 25) broadly oval, rather convex and shiny; body colour yellowish-brown, elytra with darker periphery and narrow explanate part light yellowish, paired sub-sutural dark stripes on medial part; scutellar shield distinctly transverse; dorsum finely punctate; base of pronotum about as wide and base of elytra; elytra slightly longer than broad with sparse, tiny, white, appressed setae near lateral edges.

Head: transverse, about 1.3x as broad as long, frons feebly depressed; punctures on vertex round, about as coarse as those of eye facets; punctation on frons round, distinct, diameter about as large as those of vertex, separated by about 1-2 diameter of punctures, few short, white appressed setae on frons while vertex is nearly glabrous; eyes small and non-projecting, about 0.4x as long as head, outer margin rounded, coarsely faceted; temple indistinct. Antenna about 1.3x as long as head; antennal club about 1.8x as long as broad, about 0.3x as long as antenna, club segments loosely attached.

Prothorax: transverse (1.0:1.9), anterior margin broadly emarginate; sides arcuate, posterior margin bisinuate, anterior and posterior angles somewhat pointed. Pronotal surface distinctly punctate; punctures round, dense, about as large as those on frons, separated on top of pronotal disc by 0.5-1 diameter; very fine, appressed setae on disc.

Scutellar shield (Figs. 30, 36): rather short, transverse, about 3x as broad as long, triangular and somewhat rounded apically; punctures and setae indistinct.

Elytra: slightly longer than broad (Figs. 32, 40), anterior margin closely fit with posterior margin of prothorax, about as wide as base of prothorax (Figs. 34, 38); humeral angles nearly right-angled, sides arcuate, borders somewhat explanate, apices conjointly rounded; punctures about as large as those on pronotum, separated by 1-2 diameters; setae golden, very fine, short, appressed and posteriorly directed.

Abdominal tergites fully covered by the elytra, setae golden, moderately long, densely and uniformly arranged, decumbent and posteriorly directed. Posterior margin of pygidium (Fig. 5) bearing a tuft of setae in mid-dorsal region, setae gradually shorter anterad.

Ventral side: uniformly testaceous-brown. Prosternal process with truncate apex. Metasternum punctate. Posterior edge of fifth abdominal ventrite and anal sclerite (Fig. 48) in male densely setose, with a bunch of longer setae at mid-ventral region.

Aedeagus (Figs. 15–16, 42–43): Tegmen (Figs. 15, 42) elongated, subparallel and slightly narrowed in apical third, spatula-shaped with a small tuft of setae on middle of apex; tip of the apex somewhat truncate. Median lobe (Figs. 16, 43) elongate and narrow, apex acuminate.

Measurements (in mm.): Total length 3.38–3.52, width of head across eyes 0.74–0.81, length of antenna 0.68–0.75, length and width of prothorax 1.01–1.13 and 1.94–2.13, length and width of elytra together 2.06–2.20 and 1.94–2.13.

Material examined: Holotype ♂ INDIA: Sikkim, Cherrybagh, Bamboo Bar, 14.iv.1983, B. N. Das & party; Paratypes. 5 ex., data same as holotype; Paratype. 1 ex., Arunachal Pradesh, Abor Expedition, Rotung, 1400 ft. (427 m.), 28.xii.1911, S. W. Kemp, ex. under leaf sheath of bamboo.

Distribution: INDIA: Sikkim, Arunachal Pradesh.

Etymology: This species is named after Dr. Dinendra Raychaudhuri, Former Professor,

Department of Zoology, University of Calcutta for his untiring support and encouragement to one of the authors (JD) in her research work.

Comparative note: This species resembles the Indian species, *Cryptarcha dubia* Grouvelle, 1890 in shape and size but can be differentiated from the former by the following features: distinctly transverse scutellar shield (Figs. 30, 36), about 3x as broad as long; elytra together slightly longer than broad (Figs. 32, 40), anterior margin of elytra as wide as base of prothorax and prothoracic base and anterior margin of elytra make no demonstrable angle at their junction and the junction appears like a slight sinuation of outer margin (Figs. 34, 38); tegmen (Figs. 15, 42) of male genitalia with subparallel sides, slightly narrowed in apical third, tip of the apex somewhat truncate with a small tuft of setae [vs. scutellar shield (Figs. 31, 37) less transverse, about 2x as broad as long; anterior margin of elytra slightly narrower than base of prothorax (Figs. 35, 39) and these make distinct obtuse angle at their junction; elytra together slightly broader than long (Figs. 33, 41); tegmen of male genitalia (Figs. 44, 46) elongate, slightly inflated medially and bear rather short, tiny, sparse setae on its apex in *C. dubia*]. The species show resemblances with *Cryptarcha inhalita* (Fig. 23), but can be differentiated from the latter by the rounded apex of prosternal process (Fig. 2), absence of row of setae and dark patches on elytra; apical margin of tegmen (Figs. 15, 42) with a tuft of setae, median lobe (Figs. 16, 43) with sub-parallel sides [vs. slightly notched apex of prosternal process (Fig. 23), elytra bearing dark patches and row of setae (Fig. 23), tegmen of male genitalia with scattered setae on apical margin (Fig. 19), median lobe (Fig. 20) somewhat widened and slowly narrowed in apical one-fourth towards apex in *C. inhalita*]. The species also shows resemblances with another Indian species, *Cryptarcha maculata* Reitter, 1873 but can be differentiated from the latter by its uniform testaceous-brown colour, absence of coloured patches on elytra; presence of single type of setae on dorsum; prosternal process with truncate apex; median lobe of male genitalia with uniformly wide except apical region, and tegmen spatula-shaped, larger than median lobe,

possessing apical tuft of setae in the middle [vs. dark brown body with pale reddish patches on elytra; presence of two types of setae on dorsum- thick, semi-erect ones, and fine, appressed ones; prosternal process with apex medially notched; median lobe of male genitalia (Fig. 13b) with subparallel sides, distinctly narrowed in apical one-fourth with acuminate tip and tegmen (Fig. 13a) narrow, sides subparallel and gently tapering (Figs. 13a, 14) in the apical third of its length with a dense tuft of setae at the apex in *C. maculata*]. *C. raychaudhurii* shares some similarities with another Indian species *Cryptarcha wallacei andrewesi* Grouvelle, 1908 but can be differentiated from the latter by the following characters: prothorax less than 2x as wide as long, elytra unicolourous yellowish brown and apex of median lobe of male genitalia sub-acuminate (vs. prothorax slightly more than 2x as wide as long, elytra unicolorous black and apex of median lobe of male genitalia rounded in *C. wallacei andrewesi*). *C. raychaudhurii* differs from the Indo-Malayan species *Cryptarcha bakeri* Grouvelle, 1914 in the following combination of characters: body devoid of coloured patches, tegmen of male genitalia comparatively longer with sides subparallel in the basal three-fourth and gradually narrowing towards apical fourth and apex with a tuft of setae arranged in a narrow column, median lobe with apex somewhat acuminate (vs. body with coloured patches on dorsum, tegmen of male genitalia with sides subparallel in basal two-third and sharply narrowing towards apical third and apex with dense tuft of setae arranged in a wider column on the apical margin, median lobe with apex rounded in *C. bakeri*). *C. raychaudhurii* differs from Burmese species *Cryptarcha aurora* Kirejtshuk, 1987 in the following combination of characters: body unicolourous yellowish brown, prosternal process with rounded apex (vs. body with coloured patches on dorsum and prosternal process with notched apex in *C. aurora*).

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New records of Dolichopodidae (Diptera) from Central Provinces of Iran

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Abstract

317 specimens of Dolichopodidae were collected and 19 species were identified to species or genus level. Three dolichopodid species [*Medetera jacula* (Fallén, 1823), *Rhaphium albifrons* Zetterstedt, 1843 and *Thrypticus bellus* Loew, 1869] are recorded for the first time from Iran. The new distribution of 11 genera and 16 species in the Markazi and Lorestan Provinces are presented.

Keywords: *Dolichopodidae*, Iran, Markazi, Lorestan, new records.

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Introduction

Markazi province is located at the eastern junction point of Alborz and Zagros Mountains with an altitudinal range of 1000-2500 m. Various field crops and fruit orchards, as well as large scale nurseries of ornamental plants, are located in this area, bordering plains and high mountains covered with natural vegetation (Rakhshani *et al.*, 2008). The Lorestan province chiefly consists of mountains, with numerous ranges, part of the Zagros chain, running northwest to southeast. As it lies on the westernmost slopes of the Zagros Mountains, annual precipitation in Lorestan is among the highest within Iran, south of the Alborz Mountains (Ghahari *et al.*, 2012).

Information available about Dolichopodidae of the Central Iranian provinces is limited. Grichanov *et al.* (2010) is the only reference from the Markazi province. The authors found 8 species in the province in addition to several unidentified females. None of these species were reported from the Lorestan province. The present research contributed new records from the Central Iran, including *Medetera jacula* (Fallén, 1823), *Rhaphium albifrons* Zetterstedt, 1843 and

Thrypticus bellus Loew, 1869 found for the first time in Iran (see Khaghaninia *et al.*, 2013; Gharajedaghi *et al.*, 2014; Kazerani *et al.*, 2014a-e, 2015).

Materials and Methods

The material was sampled from 64 sites in the Markazi and Lorestan provinces by standard sweep net during 2014-2015. All the identified species were checked by the Dr. Igor Ya. Grichanov. Sampling data include: Location, Coordinates (DM), Altitude (m amsl), dominant plant community and sample number. The specimens are preserved in ethyl alcohol and deposited in Shiraz Branch, Islamic Azad University, Shiraz, Iran.

Results

317 specimens of Dolichopodidae were collected, and 19 species were identified to species or genus level. The new distribution of 11 genera and 16 species in the Markazi and Lorestan Provinces are presented. Three dolichopodid species (*Medetera jacula* (Fallén, 1823), *Rhaphium albifrons* Zetterstedt, 1843 and *Thrypticus bellus* Loew, 1869) are recorded for the first time in Iran.

Argyra Macquart, 1834

Argyra leucocephala (Meigen, 1824)

Material: Lorestan province: Golbahar Sheikh Miri, 22-Sep-15, 33°11.60' N, 49°40.22 E, 2049 m, on *Poa balbosa* under *Salix* sp. (Trees), 1♂ (Leg. A. Ahmadi).

Reference: Grichanov *et al.*, 2010.

Campsicnemus Haliday, 1851

Campsicnemus sp.

Material: Lorestan province: Ab Sefid water fall, 22-Sep-15, 32°59.80' N, 49°35.17 E, 2127 m, on Graminae under *Juglans regia* (Trees), 1♀ (Leg. A. Ahmadi).

Campsicnemus umbripennis Loew, 1856

Material: Markazi province: Haji Abad, 13-Apr-15, 34°04.16' N, 49°49.21 E, 1700 m, on *Medicago sativa*, 1♂ (Leg. A. Ahmadi).

Reference: Kazerani *et al.*, 2014a.

Chrysotus Meigen, 1824

Chrysotus angulicornis Kowarz, 1874

Material: Markazi province: Khondab, 19-May-15, 34°23.30' N, 55°11.05 E, 1700 m, on *Medicago sativa*, 5♂14♀ (Leg. A. Ahmadi).

Reference: Grichanov *et al.*, 2010; Kazerani *et al.*, 2014b.

Chrysotus suavis Loew, 1857

Material: Markazi province: Mahdi Abad, 10-Jul-15, 34°02.56' N, 55°20.53 E, 1900 m, Wheat farm (*Triticum aestivum*), 1♂1♀; Khondab, 19-May-15, 34°23.30' N, 55°11.05 E, 1700 m, on *Medicago sativa*, 4♂3♀; Shahsavaran, 27-Apr-15, 34°10.26' N, 56°01.19 E, 1700 m, on *Medicago sativa*, 1♀ (Leg. A. Ahmadi).

Reference: Grichanov *et al.*, 2010; Kazerani *et al.*, 2014b.

Dolichopus Latreille, 1796

Dolichopus excisus Loew, 1859

Material: Markazi province: Hak Sofla, 28-Aug-15, 33°59.58' N, 55°22.06 E, 1900 m, *Typha* sp., 1♂2♀; Hendoogar, 13-Sep-15, 33°46.61' N, 49°14.45 E, 2070 m, on *Chenopodium* sp., 1♂ (Leg. A. Ahmadi).

Reference: Grichanov *et al.*, 2010.

Dolichopus griseipennis Stannius, 1831

Material: Markazi province: Hak Sofla, 28-Aug-15, 33°59.58' N, 55°22.06 E, 1900 m, *Typha* sp., 1♀ (Leg. A. Ahmadi).

Reference: Grichanov *et al.*, 2010; Kazerani *et al.*, 2013a; Gharajedaghi *et al.*, 2014.

Dolichopus signifer Haliday, 1832

Material: Markazi province: Hak, 10-Jul-15, 34°59.58' N, 55°22.06 E, 1900 m, on *Juncus* sp. and *Salix* sp. (Trees); Sarsakhti Olya, 28-Aug-15, 33°49.00' N, 49°21.90 E, 2120 m, *Mentha* sp. and *Equistum* sp. under *Populus* sp. (Trees), 1♂1♀; Gavgodar, 10-Sep-15, 34°06.45' N, 49°21.80 E, 1826 m, on *Typha* sp., *Salvia* sp., *Medicago sativa* and *Salix* sp., 1♂2♀; Baneh, 12-Sep-15, 34°04.41' N, 49°21.80 E, 2021 m, on *Rumex* sp. under *Juglans regia* (Trees), 5♂5♀; Baneh, 12-Sep-15, 34°04.41' N, 49°21.80 E, 2021 m, on *Lolium* sp. under *Juglans regia* (Trees), 1♂2♀; Baneh, 12-Sep-15, 34°04.41' N, 49°21.80 E, 2021 m, on *Amaranthus* sp., *Plantago* sp. and *Sinapis arvensis*, 9♂8♀; Sarsakhti Olya, 13-Sep-15, 34°49.99' N, 49°21.46 E, 2117 m, on *Salvia* sp. under *Populus* sp. (Trees), 1♀; Hendoogar, 13-Sep-15, 33°46.61' N, 49°14.45 E, 2070 m, on *Chenopodium* sp., 1♂; Galehchi Olya, 28-Sep-15, 33°57.53' N, 49°07.46 E, 2153 m, on *Medicago sativa*, 1♀ (Leg. A. Ahmadi); Lorestan province: Golbahar Sheikh Miri, 22-Sep-15, 33°11.60' N, 49°40.22 E, 2049 m, on *Poa balbosa* under *Salix* sp. (Trees), 1♂2♀.

Reference: Grichanov *et al.*, 2010; Khaghaninia *et al.*, 2013; Kazerani *et al.*, 2013a.

Medetera Fischer von Waldheim, 1819

Medetera jacula (Fallén, 1823)

(Plate 1. Figs. 1-4)

Material: Markazi province: Hak, 10-Jul-15, 34°59.58' N, 55°22.06 E, 1900 m, on *Juncus* sp. and *Salix* sp. (Trees), 1♂; Sefid Shaban, 27-Jul-15, 34°37.51' N, 49°56.75 E, 2317 m, 6♂8♀; Nakhjirvan, 28-Jul-15, 33°56.12' N, 50°36.44 E, 1519 m, on *Typha* sp., 1♂1♀; Mahallat, 28-Jul-15, 33°53.63' N, 50°32.23 E, 1541 m, on *Typha* sp. and *Polygonum* sp., 1♂; Sarsakhti Olya, 28-Aug-15, 33°49.00' N, 49°21.90 E, 2120 m, Under *Salix* sp. and *Populus* sp. (Trees), 1♂1♀; Baneh, 12-Sep-15, 34°04.41' N, 49°21.80 E, 2021 m, on *Rumex* sp. under *Juglans regia* (Trees), 1♀; Baneh, 12-Sep-15, 34°04.41' N, 49°21.80 E, 2021 m, on *Amaranthus* sp., *Plantago* sp. and *Sinapis arvensis*, 1♂; Ghaghan, 22-Sep-15, 33°48.88' N, 49°29.88 E, 2070 m, on *Juncus* sp., 1♂; Arjenavand, 25-Sep-15, 34°20.80' N, 49°20.43 E, 2056m, on *Phragmites australis* and *Vitis vinifera*, 1♀ (Leg. A. Ahmadi); Lorestan province: Khak Patieh, 22-Sep-15, 33°07.83'

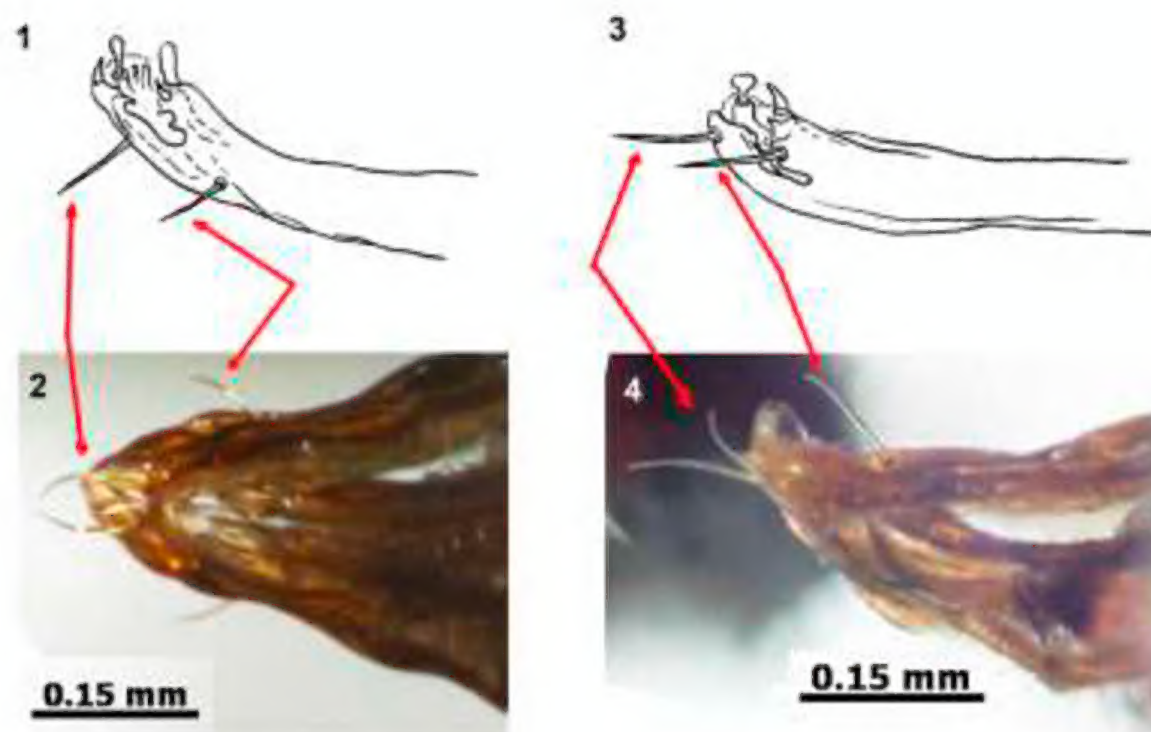


Plate 1. Figures 1 & 2 *Medetera jacula* (Fallén, 1823); **3 & 4.** *Medetera meridionalis* Negrobov, 1967. 1 & 3. Lateral view: male surstyli, distal part (after Negrobov, 2010); 2. Dorsal view; 4. Dorsolateral view.

N, 49°39.48 E, 2061 m, on *Mentha* sp. under *Salix* sp. (Trees), 1♂4♀, 22-Sep-15, 33°05.86' N, 49°39.62 E, 2121 m, on *Mentha* sp. and *Alhaji* sp., 1♀.

Remarks: *Medetera jacula* and *M. meridionalis* Negrobov, 1967 are abundant sister species in Iran, hardly differing from each other by habitual characters. Grichanov and Ovsyannikova (2015) proposed recently reliable and stable diagnostic character to distinguish males of the two forms, based on the position of two strong dorsolateral bristles on the apex of hypopygial surstylus. The *M. jacula* males have rather long distance between the two bristles, about as long as the longest bristle. *M. meridionalis* males bear the two bristles more apically on surstylus, having distance between them about half as long as the longest bristle. This feature is more appropriate than other diagnostic characters of the two species listed and figured by Negrobov (2010) to distinguish them, such as the wing venation, the number of dorsocentral bristles on mesonotum and the shape of fine microscopic setae on the apex of surstyli. New record from Iran.

Poecilobothrus Mik, 1878

Poecilobothrus principalis (Loew, 1861)

Material: Markazi province: Hak, 10-Jul-15, 34°59.58' N, 55°22.06 E, 1900 m, on *Juncus* sp. and *Salix* sp. (Trees), 1♀ (Leg. A. Ahmadi).

Reference: Kazerani *et al.*, 2014d.

Rhaphium Meigen, 1803

Rhaphium sp.

Material: Markazi province: Hendoodar, 13-Sep-15, 33°46.61' N, 49°14.45 E, 2070 m, on *Juncus* sp., 3♀; Lorestan province: Khak Patieh, 22-Sep-15, 33°07.83' N, 49°39.48 E, 2061 m, on *Mentha* sp. under *Salix* sp. (Trees), 1♀ (Leg. A. Ahmadi).

Rhaphium albifrons Zetterstedt, 1843

(Plate 2. Figs. 1-3)

Material: Markazi province: Kouhin, 27-Jul-15, 34°37.51' N, 49°56.75 E, 2053 m, on *Juncus* sp. and *Mentha* sp. under *Salix* sp. and *Juglans regia* (Trees), 1♂ (Leg. A. Ahmadi).

Diagnosis: *Rh. albifrons* can be reliably distinguished from the closest species by male genital structures only. It has hypopygial surstylus narrow, nearly reaching apex of longer cercal lobe, with small inner projection (see Negrobov *et al.*, 2013: Fig. 16). New record from Iran.

Rhaphium appendiculatum Zetterstedt, 1849

Material: Markazi province: Gavgodar, 31-Aug-15, 34°06.45' N, 49°21.80 E, 1826 m, on *Typha* sp., *Salvia* sp., *Juncus* sp. and *Salix* sp., 1♂; Lorestan province: Ghaghan, 22-Sep-15, 33°48.88' N, 49°29.88 E, 2070 m, on *Juncus* sp., 1♂, 22-Sep-15, 33°35.18' N, 49°29.87 E, 2034 m, on *Juncus* sp. and *Mentha* sp., 1♀; Khak Patieh, 22-Sep-15, 33°07.83' N, 49°39.48 E, 2061 m, on *Mentha* sp. under *Salix* sp. (Trees), 2♂ (Leg. A. Ahmadi).

Reference: Kazerani *et al.*, 2013b.

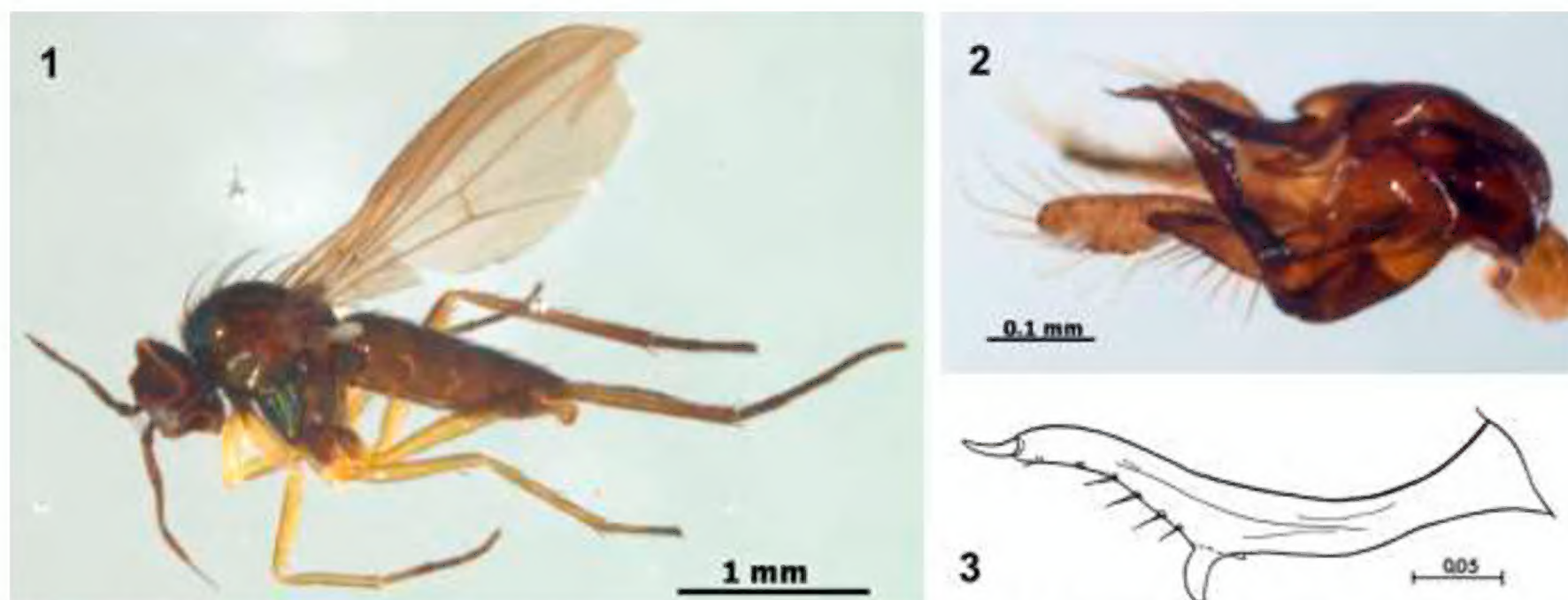


Plate 2. Figures 1-3. *Rhaphium albifrons* Zetterstedt, 1843: 1. Male habitus; 2. Hypopygium, lateral view; 3. Male surstylus, lateral view (after Negrobov *et al.*, 2013).

***Sympycnus* Loew, 1857**

Sympycnus pulicarius (Fallén, 1823)

Material: Markazi province: Galehchi Olya, 28-Sep-15, 33°57.53' N, 49°07.46 E, 2153 m, on *Medicago sativa*, 1♂ (Leg. A. Ahmadi).

Reference: Kazerani *et al.*, 2014a.

***Syntormon* Loew, 1857**

Syntormon aulicus (Meigen, 1824)

Material: Lorestan province: Joushan, 22-Sep-15, 33°21.43' N, 49°44.39 E, 2040 m, on *Typha* sp. and *Chenopodium* sp., 1♀ (Leg. A. Ahmadi).

Reference: Kazerani *et al.*, 2014c.

Syntormon denticulatus (Zetterstedt, 1843)

Material: Markazi province: Hak, 10-Jul-15, 34°59.58' N, 55°22.06 E, 1900 m, on *Juncus* sp. and *Salix* sp. (Trees), 1♀; Nakhjirvan, 28-Jul-15, 33°56.12' N, 50°36.44 E, 1519 m, on *Typha* sp., 1♂; Gavgodar, 31-Aug-15, 34°06.45' N, 49°21.80 E, 1826 m, on *Typha* sp. and *Salix* sp. (Trees), 2♂1♀; Gavgodar, 31-Aug-15, 34°06.45' N, 49°21.80 E, 1826 m, on *Typha* sp., *Salvia* sp., *Juncus* sp. and *Salix* sp., 2♀; Ghaghan, 22-Sep-15, 33°48.88' N, 49°29.88 E, 2070 m, on *Juncus* sp., 2♀; Lorestan province: Golbahar Sheikh Miri, 22-Sep-15, 33°11.60' N, 49°40.22 E, 2049 m, on *Poa bulbosa* under *Salix* sp. (Trees), 1♂1♀, 22-Sep-15, 33°09.75' N, 49°40.73 E, 2024 m, on *Typha* sp. and *Juncus* sp., 1♀; Khak Patieh, 22-Sep-15, 33°07.83' N, 49°39.48 E, 2061 m, on *Mentha* sp. under *Salix* sp. (Trees), 7♂2♀; Ab Sefid waterfall, 22-Sep-15, 32°59.80' N, 49°35.17 E, 2127 m, on Graminae under *Juglans regia* (Trees), 1♂ (Leg. A. Ahmadi).

Reference: Kazerani *et al.*, 2014c.

Syntormon pallipes (Fabricius, 1794)

Material: Markazi province: Hosein Abad, 10-Jul-15, 34°02.20' N, 49°46.56 E, 1877 m, on *Juncus* sp. under *Juglans regia* (Trees), 4♂1♀; Hak, 10-Jul-15, 34°59.58' N, 55°22.06 E, 1900 m, on *Juncus* sp. and *Salix* sp. (Trees), 1♂; Hosein Abad, 09-Sep-15, 34°02.20' N, 49°46.56 E, 1877 m, on *Juncus* sp. under *Fraxinus* sp. (Trees), 1♂1♀; Galehchi Olya, 28-Sep-15, 33°57.24' N, 49°07.47 E, 2174 m, on Poaceae under *Juglans regia* (Trees), 2♂ (Leg. A. Ahmadi); Lorestan province: Golbahar Sheikh Miri, 22-Sep-15, 33°11.60' N, 49°40.22 E, 2049 m, on *Poa bulbosa* under *Salix* sp. (Trees), 40♂39♀; Golbahar Sheikh Miri, 22-Sep-15, 33°11.60' N, 49°40.22 E, 2049 m, on *Poa bulbosa* under *Salix* sp. (Trees), 1♀; Khak Patieh, 22-Sep-15, 33°07.83' N, 49°39.48 E, 2061 m, on *Mentha* sp. under *Salix* sp. (Trees), 3♂2♀.

Reference: Negrobov and Matile, 1974; Grichanov *et al.*, 2010; Gharajedaghi *et al.*, 2014; Kazerani *et al.*, 2014c.

***Teuchophorus* Loew, 1857**

Teuchophorus sp.

Material: Markazi province: Gavgodar, 10-Sep-15, 34°06.45' N, 49°21.80 E, 1826 m, on *Typha* sp., *Salvia* sp., *Medicago sativa* and *Salix* sp., 1♀ (Leg. A. Ahmadi).

***Thrypticus* Gerstaecker, 1864**

Thrypticus bellus Loew, 1869 (Plate 3)

Material: Markazi province: Hosein Abad, 10-Jul-15, 34°01.49' N, 49°46.27 E, 1886 m, on *Juncus* sp. under *Juglans regia* (Trees), 8♂8♀; Hosein Abad, 10-Jul-15, 34°02.20' N, 49°46.56 E, 1877 m, on *Juncus* sp. under

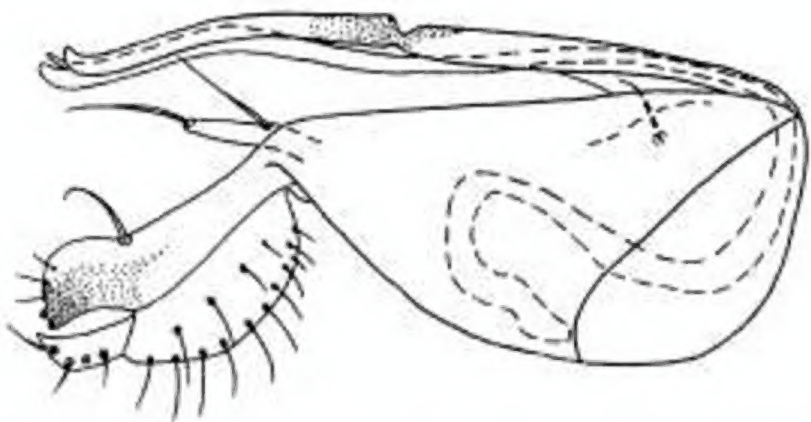


Plate 3. *Thrypticus bellus* Loew, 1869, hypopygium, lateral view (after Grichanov *et al.*, 2011).

Juglans regia (Trees), 4♂9♀; Tafresh, 27-Jul-15, 34°40.15' N, 49°58.96 E, 2102m, on *Typha* sp., 1♂; Gavgodar, 31-Aug-15, 34°06.45' N, 49°21.80 E, 1826m, on *Typha* sp., *Salvia* sp., *Juncus* sp. and *Salix* sp., 1♂1♀; Hosein Abad, 09-Sep-15, 34°02.20' N, 49°46.56 E, 1877m, on *Juncus* sp. under *Fraxinus* sp. (Trees), 11♂14♀; Arjenavand, 25-Sep-15, 34°20.80' N, 49°20.43 E, 2056m, on *Phragmites australis* and *Vitis vinifera*, 2♂2♀; Gole Zard, 28-Sep-15, 33°57.51' N, 49°09.32 E, 1985m, on *Chenopodium* sp. and *Juncus* sp., 1♀; Gole Zard, 28-Sep-15, 33°57.51' N, 49°09.32 E, 1985m, on *Juncus* sp., 1♂5♀ (Leg. A. Ahmadi); Lorestan province: Deh Nasir, 22-Sep-15, 34°25.03' N, 49°38.67 E, 1992m, on *Phragmites australis* under *Elaeagnus* sp. (Trees), 3♂4♀.

Remarks: Negrobov (1991) included Iran in the area of species *Thrypticus intercedens* Negrobov, 1967 without indicating original material. Here we add the second species of the genus to the Iranian fauna, well differing from the former in male genital structures, especially in thin simple phallus. New record from Iran.

Discussion

The identified species of the family Dolichopodidae were sampled from an altitude 1519 – 2317 m. Most of the collected species are widespread across the Palearctic Region. According to sampling data, the species *S. pallipes* and *T. bellus* respectively have the highest sample number. The species *M. jacula*, *S. denticulatus*, *S. pallipes* respectively, have the highest total distribution along whole sampling sites at the study area. According to Kazerani *et al.* (2014e), the Iranian fauna of Dolichopodidae includes 104 species known mainly from northern and

north-western Iran. Later, four species of the genus *Sciapus* Zeller, 1842, collected from forests of northern Iran (Mazandran and Guilan provinces) have been added to the country list (Kazerani *et al.*, 2015). Three dolichopodid species are recorded for the first time from Iran in our paper. The Central Iranian dolichopodid fauna, however, remains poorly studied.

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